Color Correction Algorithm based on Local Similarity of Stereo Images*

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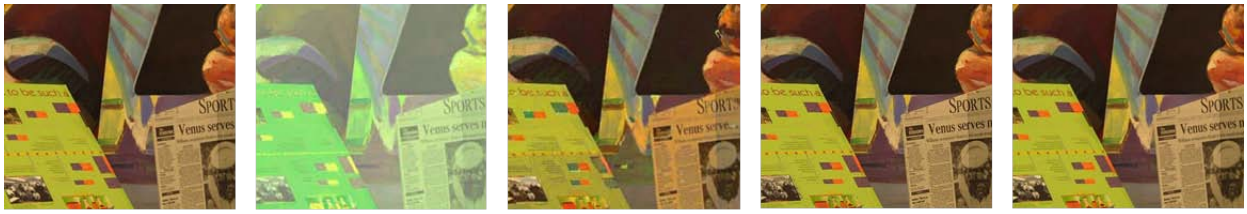

(a) (b) (c) (d) (e)

Figure 1: *(a) Original left image (target image) (b) Original right image (reference image) (c) Color corrected ground truth of (b) to (a) (d) Color corrected image of (b) utilizing previous work's method (e) Color corrected image of (b) utilizing our method*

Keywords: Color correction, Stereoscopic

1 Introduction

In stereoscopic 3D content creation utilizing stereo camera, luminance and color discrepancies between stereo images often exists. These discrepancies result in incorrect depth information extraction during post-production and cause visual fatigue for the audience. In stereoscopic color correction research, local methods are generally superior to global methods, because the stereo image has local color discrepancies. However, previous local methods [Wang et al. 2011] cannot manage specific local color discrepancies such as highlighting and various illumination conditions, because these methods only obtain and apply a sparse sampling of the correspondences on the image. Thus, they can generate biased color compensating results.

The proposed method can solve the problems of the previous method by extracting relevant correspondence pair data for color transfers using a modified stereo matching algorithm, and by compensating the color using weighted sum of color differences considering local features that can represent local luminance and color discrepancies.

2 Our Approach

We applied a modified stereo matching algorithm to locate correspondence pairs for effective matching point extraction. We employ local structure information, NCC (Normalized cross correlation) and Census Transform, for calculating matching costs in the gray level. In the interest of maintaining the original disparity, matching point extraction is performed using the method in [Sun et al. 2011] except for propagation process.

For all correspondence pairs, a CDLT (color difference look-up table) is composed of the CIELab space ΔE_{00} color difference, which is perceptually uniform. Then, based on CDLT, we remove the specific index that has an inconsistent color difference. We calculate a weighted sum value based on color differences of locally similar corresponding pairs. Initially, for a given pixel *i* and CDLT index *j*, we extract *N* sample indexes that have color similarity to the given pixel. Subsequently, the weight is computed for each sample index by combining two normalized measures representing local relation, color difference, and spatial distance. The final color correction value is computed using the weighted sum of the sample indexs color differences:

$$C_{corr,i} = C_{ori,i} + \sum_{j=1}^{N} w_{i,j} \cdot \Delta E_{00}(i,j), \quad (1)$$

$$w_{i,j} = w_{c,i,j} + w_{s,i,j} \quad (2)$$

3 Conclusion

In this paper, we proposed a new method to enhance the accuracy of stereo image color correction. The main technique involves extracting a relevant corresponding pair by applying a modified stereo matching algorithm, and using them in a compensating process that considers local feature weighing. Therefore, our method produces more accurate results compared to previous work, and it demonstrates robustness when managing illumination variations and occlusion areas. Future work will be to obtain a more accurate correction that removes sparked pixels, and will be extended to include stereo video.

References

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