A Study for Yamanaka Images for Camera

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Abstract. A camera uses a CFA to have the colors of the scene in a picture. Therefore, the downscaled red, green, and blue information are obtained, and an upsampling process is mandatorily needed. In this paper, we study on Yamanaka patterned CFA in different color combination.

Keywords: Downsampling, upsampling, CFA, different pattern.

1 Introduction

For digital cameras, scene colors are obtained by a single CCD or CMOST sensor array due to price issue [1-5]. There have been many color restoration approaches proposed [6-27]. In this paper, we present a new color demosaicking method based on different color patterns such as Yamanaka. Section 2 explains presented CFA patterns and filter size combination. The proposed approach's performance is studied and explained in Section 3. Finally, we report the conclusions in Section 4.

2 Bayer to Yamanaka patterns Transition Figure

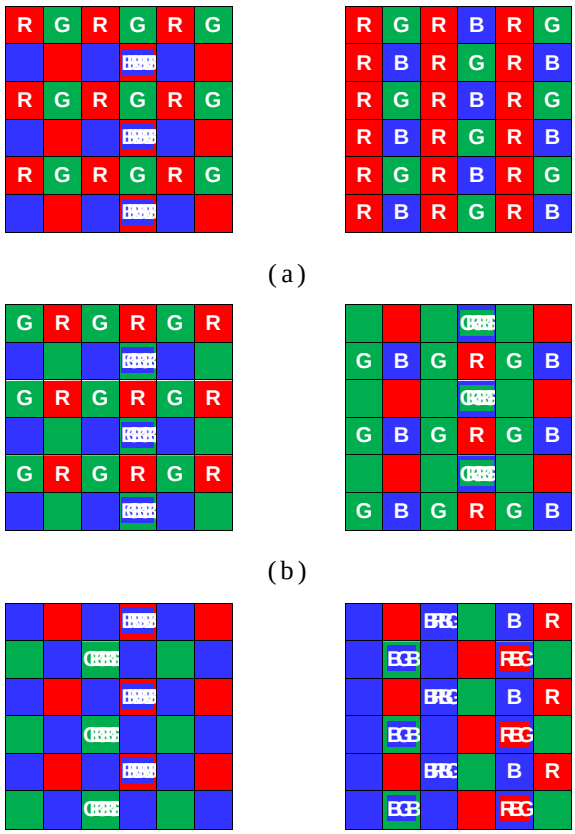
1 shows the Bayer to Yamanaka pattern transition.

3 Least Squares Methods

The least-squares method [28] was used to obtain filters.

4 Experimental results

In this paper, two performance metrics were used: CPSNR and SCIELAB [29]. We used ten LC images with the size of 720×540 or 540×720 [30]. Figure 2 and Fig. 3 show an example of CPSNR and SCIELAB results.



(a)

(b)

(c)

Fig. 1. Bayer and Yamanaka patterns used in single-CCD digital cameras: (a) RRGB, (b) RGGB, and (c) RGBB.

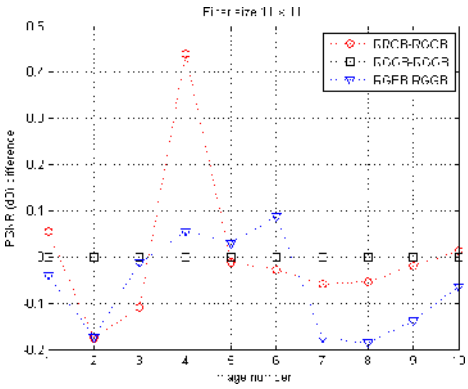


Fig. 9. Average CPSNR results.

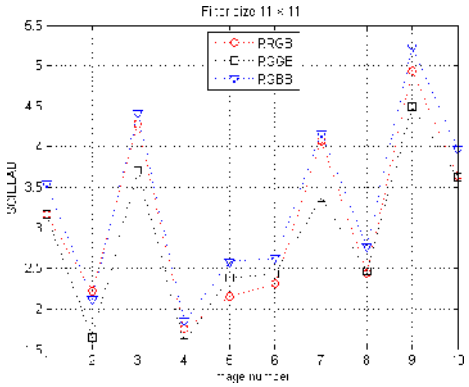


Fig. 10. Average SCIELAB results.

5 Conclusions

In this article, we studied the impact between filter size and color configuration.

References

1. H. J. Trussell and R. E. Hartwig, “Mathematics for demosaicking,” IEEE Trans. Image Processing, vol. 11, no. 4, pp. 485-492, Apr. 2002.
2. K. Hirakawa and P. J. Wolfe, “Spatio-spectral color filter array design for optimal image recovery,” IEEE Trans. Image Processing, vol. 17, no. 10, pp. 1876-1890, 2008.
3. B. E. Bayer, “Color imaging array,” U.S. Patent 3 971 065, July 1976.
4. S. Yamanaka. Solid state color camera, U.S. Pat. 4,054,906, 1977.
5. A. Munoz, T. Blu, and M. Unser, “Least-squares image resizing using finite differences,” IEEE Trans. Image Processing, vol. 10, no. 9, pp. 1365-1378, 2001.
6. J. Wu, A. Paul, Y. Xing, Y. Fang, J. Jeong, L. Jiao, G. Shi, Morphological dilation image coding with context weights prediction. Signal Processing: Image Communication, vol. 25, no. 10, pp.717-728, (2010).
7. M. Anisetti, C. A. Ardagna, E. Damiani, F. Frati, H. A. Müller, and A. Pahlevan: Web Service Assurance: The Notion and the Issues. Future Internet 4(1): 92-109 (2012).
8. M. Anisetti, C. A. Ardagna, V. Bellandi, E. Damiani, M. Döller, F. Stegmaier, T. Rabl, H. Kosch, and L. Brunie: Landmark-assisted location and tracking in outdoor mobile network. Multimedia Tools Appl. 59(1): 89-111 (2012).
9. M. Anisetti, C. A. Ardagna, E. Damiani, and J. Maggesi: Security certification-aware service discovery and selection. SOCA (2012): 1-8.
10. M. Anisetti, C. A. Ardagna, and E. Damiani: A Low-Cost Security Certification Scheme for Evolving Services. ICWS (2012): 122-129.
11. M. Anisetti, C. A. Ardagna, V. Bellandi, E. Damiani, and S. Reale: Map-Based Location and Tracking in Multipath Outdoor Mobile Networks. IEEE Transactions on Wireless Communications 10(3): 814-824 (2011).
12. M. Anisetti, C. A. Ardagna, V. Bellandi, E. Damiani, and S. Reale: Advanced Localization of Mobile Terminal in Cellular Network. IJCNS 1(1): 95-103 (2008)

13. C.-T. Hsieh, Y.-K. Wu, and K.-M. Hung, Hybrid Watermarking Scheme for Halftone Images, International Journal of Advanced Science and Technology, 9-20, (2008).
14. R. Adipranata, E. Cherry, G. Ballangan and R. P. Ongkodjojo, Fast Method for Multiple Human Face Segmentation in Color Image, International Journal of Advanced Science and Technology, 19-32, (2009).
15. D. Bhattacharyya, A. Roy, P. Roy and T.-h. Kim, Receiver Compatible Data Hiding in Color Image, International Journal of Advanced Science and Technology, 15-24, (2009).
16. M. Drahanský, Realization of Experiments with Image Quality of Fingerprints, International Journal of Advanced Science and Technology, 79-88, (2009).
17. B.V. Ramana Reddy, A. Suresh, M. Radhika Mani and V.Vijaya Kumar, Classification of Textures Based on Features Extracted from Preprocessing Images on Random Windows, International Journal of Advanced Science and Technology, 9-18, (2009).
18. W. Wu, Z. Liu, X. He, Learning-based super resolution using kernel partial least squares, Image Vision Comput 29, 394-406, (2011).
19. W. Wu, Z. Liu, W. Gueaieb, X. He, Single-image super-resolution based on markov random field and contourlet transform, J. Electron. Imaging, 20, 023005, (2011).
20. W. Wu, Z. Liu, D. Krys, Improving laser image resolution for pitting corrosion measurement using markov random field method, Autom. Constr. 21, 172-183, (2012).
21. W. Wu, Z. Liu, M. Chen, X. Yang, X. He, An automated vision system for container-code recognition, Expert Systems with Applications, 39, 2842-285, (2012).
22. W. Wu, X. Yang, X. He, Handwritten numeral recognition by model reconstruction based on manifold learning, in: The 2007 International Conference on Information Computing and Automation (ICICA'07), (2007)
23. J. Wu, C. Liang, J. Han, Z. Hu, D. Huang, H. Hu, Y. Fang, L. Jiao, A Two-Stage Lossless Compression Algorithm for Aurora Image Using Weighted Motion Compensation and Context-Based Model, Optics Communications. Vol.290, pp.19-27, October 22, (2012).
24. Y. Fang, J. Wu, and B. Huang, 2D sparse signal recovery via 2D orthogonal matching pursuit. Science China: Inf. Sci., 55: 889-897, (2012).
25. J. Wu, T. Li, T.-J. Hsieh, Y.-L. Chang, and B. Huang, Digital Signal Processor-based 3D Wavelet Error-resilient Lossless Compression of High-resolution Spectrometer Data. Journal of Applied Remote Sensing, Vol. 5, 051504, November 28, (2011).
26. A. Paul, J. Wu, J.-F. Yang, and J. Jeong, Gradient-based edge detection for motion estimation in H.264/AVC. IET Image Processing. Vol.5,No.4, pp.323–327, (2011).
27. J. Wu, J. Huang, G. Jeon, J. Jeong, L.C. Jiao, An adaptive autoregressive de-interlacing method. Optical Engineering, Vol.5, 50, 057001, (2011).
28. H. Chen, "A special least squares method for curve fitting," in Proc. Power Electronics and Motion Control 1992, Nov (1992).
29. X. Zhang and B. A.Wandell, "A spatial extension of CIELAB for digital color image reproduction," J. Soc. Inf. Display, vol. 5, no. 1, pp. 61-67, Mar. 1997.
30. The LC image dataset, http://www.gipsa-lab.grenoble-inp.fr/~laurent.condat/imagebase.html