Locally Adaptive Color Correction for Underwater Image Dehazing and Matching

Ruyue Han

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1. Underwater Dehazing and Transmission Estimation

Author have given the simplified underwater optical model as follows:

$$I(x) = J(x)e^{-\eta d(x)} + B_{\infty}(x)(1 - e^{-\eta d(x)}) \quad (1)$$

Author used the method of He et al. [2] to dehaze the underwater images.And based on Eq 1,author give the transmission as:

$$t(x) = 1 - \min_{y \in \Omega(x)} \left(\min_{c \in r,g,b} I^{c}_{CC}(y) / {B_{\infty}}^{c} \right) \quad (2)$$

2. Results and Discussion

Transmission Qualitative Evaluation Author think their color correction approach is quit good robust and stable compared with many other DCP related methods.And we can see the result from Fig. 1.

Underwater Dehazing Evaluation As we can see from Fig 2 and Table 1, the method of author is able to yield comparative and even better outputs compared with the other analyzed techiques.

Table 1. Average values shown in Fig 2

	DCP	MDCP	UDCP	Only CC	Author
UCIQUE	0.4690	0.4927	0.5201	0.4688	0.5691
PCQI	0.9049	0.9081	0.8038	0.8417	0.9634

Underwater Image Matching The effects of strong scattering in underwater adds complexity to various computer vision algorithms such as detection and localization.Author prove the utility of their technique for the task of matching images based on local feature points considering the well-known SIFT operator [3] and get a better result than other technique.

3. Conclusion

In this paper author introduce a simple but effective color correction approach for underwater images. Inspired by the DCP [1] and the simple color transfer approach of [4],their comprehensive evaluation demonstrates that the strategy can effectively estimate transmission map and remove the haze effect for various underwater scenes. Moreover, author prove the utility of our dehazing method for a fundamental underwater computer vision application: matching images based on local feature points.

References

[1] K. He, J. Sun, and X. Tang. Single image haze removal using dark channel prior. *IEEE CVPR*, 2009. 1

[2] K. He, J. Sun, and X. Tang. Single image haze removal using dark channel prior. *IEEE Trans. on Pattern Analysis and Machine Intell*, 2011. 1

[3] D. Lowe. Distinctive image features from scale-invariant keypoints. *Int. Journal of Comp. Vision*, 2004. 1

[4] E. Reinhard, M. Adhikhim, B. Gooch, and P. Shirley. Color transfer between images. *IEEE Computer Graphics and Applications*, 2001. 1

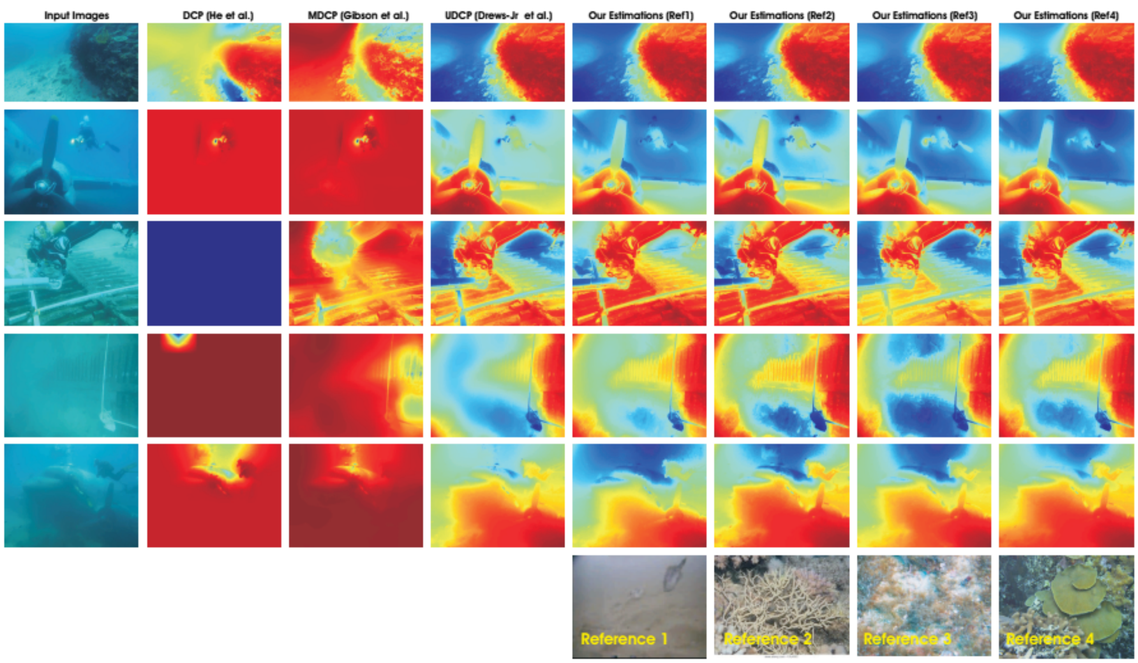

Figure 1. Estimated transmission maps generated by different specialized underwater techniques (DCP [17], MDCP [13], UDCP [20]) and our approach generated with four different reference images.

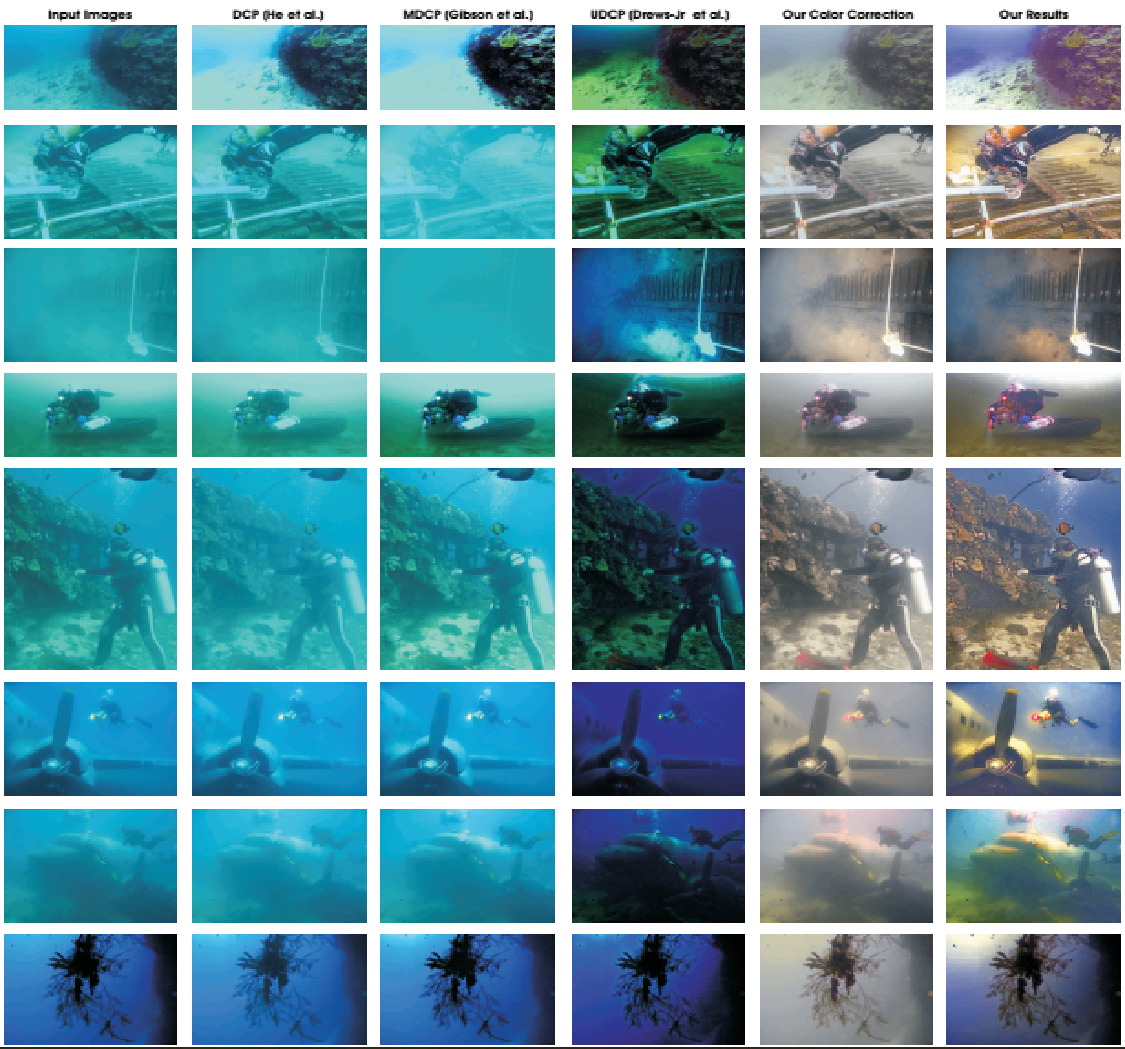

Figure 2. Estimated transmission maps generated by different specialized underwater techniques (DCP [17], MDCP [13], UDCP [20]) and our approach generated with four different reference images.