Color Restoration in Turbid Medium Supplementary Materials

In this supplementary material, we provide additional results of our proposed color restoration method on several images as well as videos.

1. RESULTS ON IMAGES

Fig. 1 provides five sets of additional results on underwater images. These images are of Scuba diving. The depth covered was around 8 meters from water surface. The input images are first dehazed and then color modulated. The modulated images are then color corrected using the learned mapping function. The results of color mapping for each of these inputs in Fig. 1(a) are given in Fig. 1(b). The color corrected images had some color cast which can be attributed to imperfection in the distance assumed for color modulation or it can be due to the unanticipated interactions of light rays inside water, which are not modelled in our image formation model. The color cast may even be due to the error in the mapping function. Since the mapping was learned for a camera and ambient light conditions it can go wrong when there are drastic changes in the acquiring conditions of the input images from the reference set-up. Hence, we apply white balancing algorithm post to color mapping to remove the unwanted color casts. The results of white balancing post to color mapping on these inputs are given in Fig. 1(c). We have also provide the results of direct white balancing (DWB) the inputs in Fig. 1(d). White balancing the input as such removes the color cast but the recovered images have less contrast and the colors are not restored properly, whereas our method removes the color cast as well as restores the colors correctly.

2. RESULT ON VIDEO

We have also provided result on an underwater video. The input video and its corresponding color corrected video is attached in '.mp4' format along with this supplementary material. The input video is given as 'Input.mp4' and corresponding result using our color correction method is provided as 'Output.mp4'.

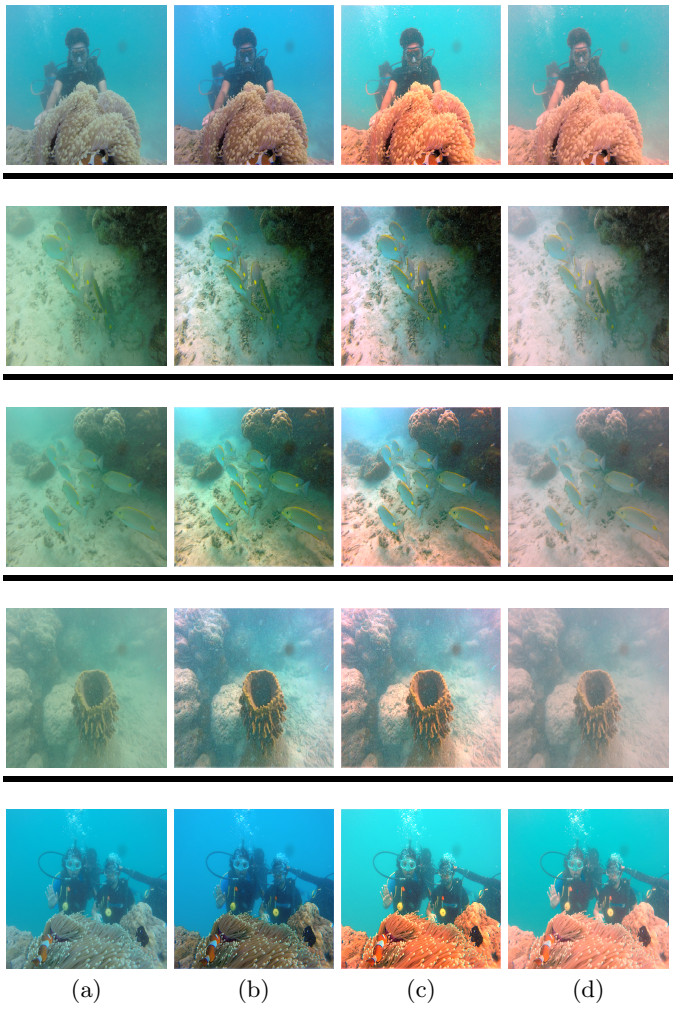

Figure 1: Additional results: (a) Input underwater images. (b) Result of color mapping. (c) Result obtained by white balancing the color mapped output in (b). (d) Result obtained by white balancing the input (a) directly.

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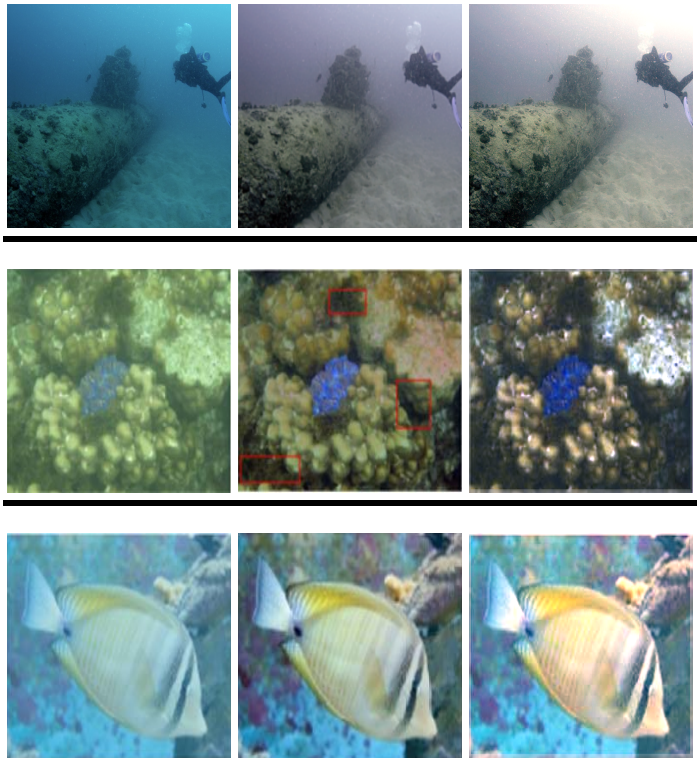
3. COMPARISONS

Comparisons with the dictionary based method proposed by Fahimeh et al.[9] (first row) and Li et al. [14] (second and third rows) are provided in Fig. 2 along with the results obtained from our method (Fig. 2 (c)). It can be clearly seen that result of our method is at par with that of [9] (first row) and colors are visually pleasing and bright when compared to [14] (second and third rows). Since ground truth was not available we did only qualitative comparisons.



(a) (b) (c)

Figure 2: Comparison results: (a) Input underwater images. (b) Result of competing methods. (c) Result obtained by our method.