Pyramid Convolutional Network for Colorization in Monochrome-Color Dual-Lens System

1 Supplementary Materials

More colorization results of the comparison methods and our method are provided in Figs. 1 - 6. We also show the SSIM values of different comparison methods in Table 1. The comparison methods include two state-of-the-art CNN-based automatic colorization methods, i.e. [Iizuka *et al.*, 2016; Zhang *et al.*, 2016], five general reference based colorization methods, i.e. [Welsh *et al.*, 2002; Ironi *et al.*, 2005; Gupta *et al.*, 2012; Furusawa *et al.*, 2017; He *et al.*, 2018], two state-of-the-art colorization algorithms for the dual-lens system, i.e. [Jeon *et al.*, 2016; Dong *et al.*, 2019], and three baseline coarse-to-fine enhancement methods, i.e. [Chen *et al.*, 2016; Khamis *et al.*, 2018; Sun *et al.*, 2018]. When using the coarse-to-fine operations in [Chen *et al.*, 2016; Khamis *et al.*, 2018] for colorization, the low resolution result is obtained by the colorization method of [Dong *et al.*, 2019].

Table 1: Average SSIM values of different colorization methods in the four datasets under Setup1 and Setup2 of our experiment. CT, MB, ST, and SF are short for the datasets of Cityscapes, Middlebury, Sintel, and SceneFlow, respectively.

	SSIM under Setup1				SSIM under Setup2			
	CT	MB	ST	SF	CT	MB	ST	SF
Welsh	0.897	0.906	0.795	0.813	0.849	0.876	0.758	0.769
Ironi	0.897	0.940	0.918	0.890	0.778	0.715	0.814	0.747
Gupta	0.948	0.896	0.933	0.869	0.906	0.893	0.905	0.750
Jeon	0.953	0.958	0.943	0.927	0.914	0.953	0.924	0.902
Furusawa	0.841	0.860	0.794	0.795	0.825	0.782	0.728	0.734
He	0.951	0.949	0.948	0.919	0.928	0.947	0.931	0.889
Zhang	0.460	0.746	0.687	0.279	0.455	0.752	0.688	0.303
Iizuka	0.757	0.677	0.852	0.411	0.751	0.688	0.852	0.414
Dong	0.982	0.981	0.983	0.988	0.979	0.976	0.977	0.984
Chen	0.966	0.958	0.965	0.959	0.961	0.952	0.958	0.955
Khamis	0.957	0.947	0.955	0.948	0.951	0.941	0.951	0.943
Sun	0.964	0.960	0.962	0.957	0.958	0.953	0.957	0.951
Ours	**0.995**	**0.995**	**0.995**	**0.991**	**0.989**	**0.988**	**0.990**	**0.987**

References

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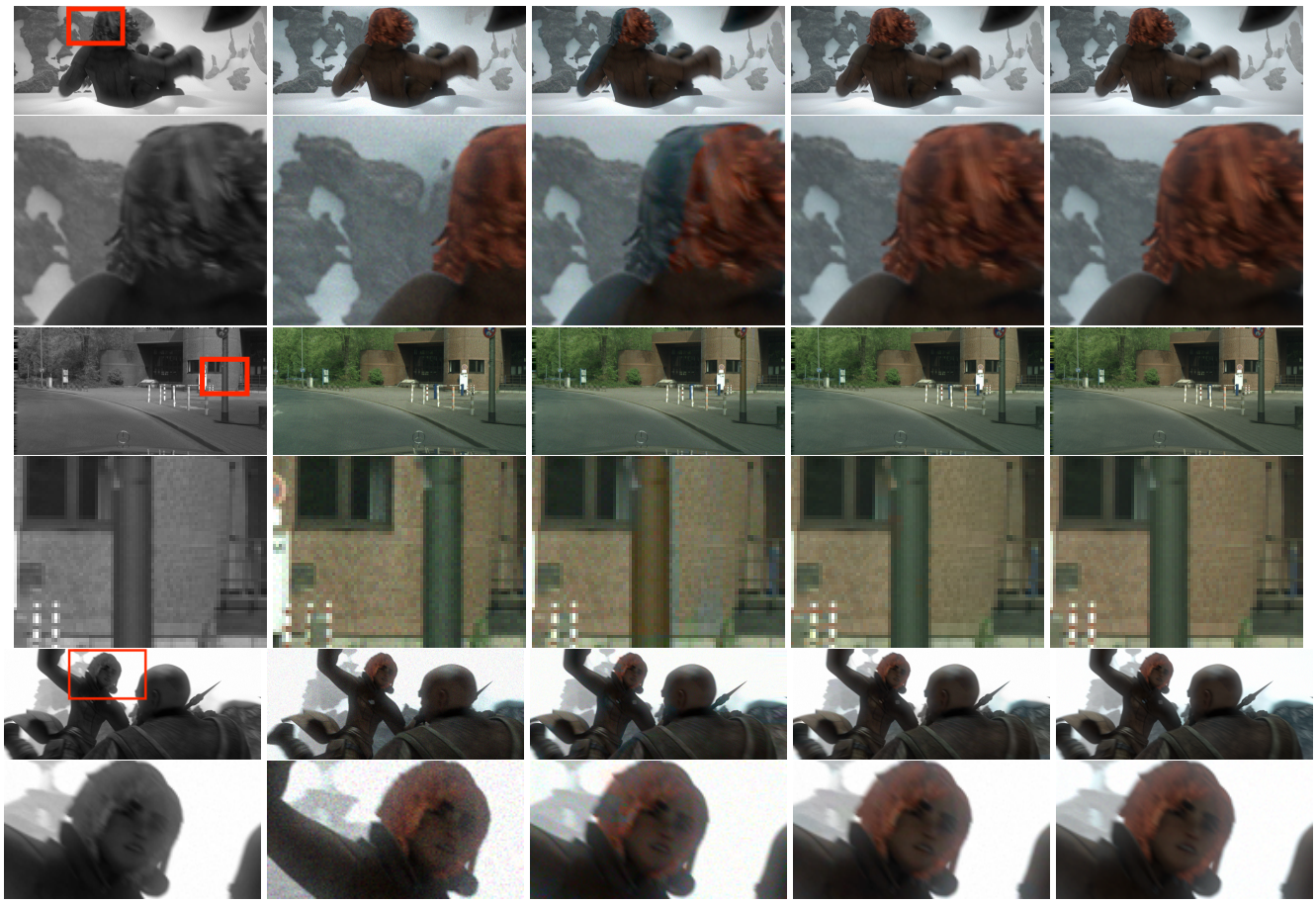
(a) Input grayscale and color images. (b) Results of Zhang et al. (c) Results of Iizuka et al. (d) Results of Furusawa et al. (e) Our result. (f) Ground truth.

Figure 1: Examples to compare deep learning based automatic colorization algorithms, i.e. Zhang et al. and Iizuka et al., manga image colorization algorithm, i.e. Furusawa et al., and our algorithm.

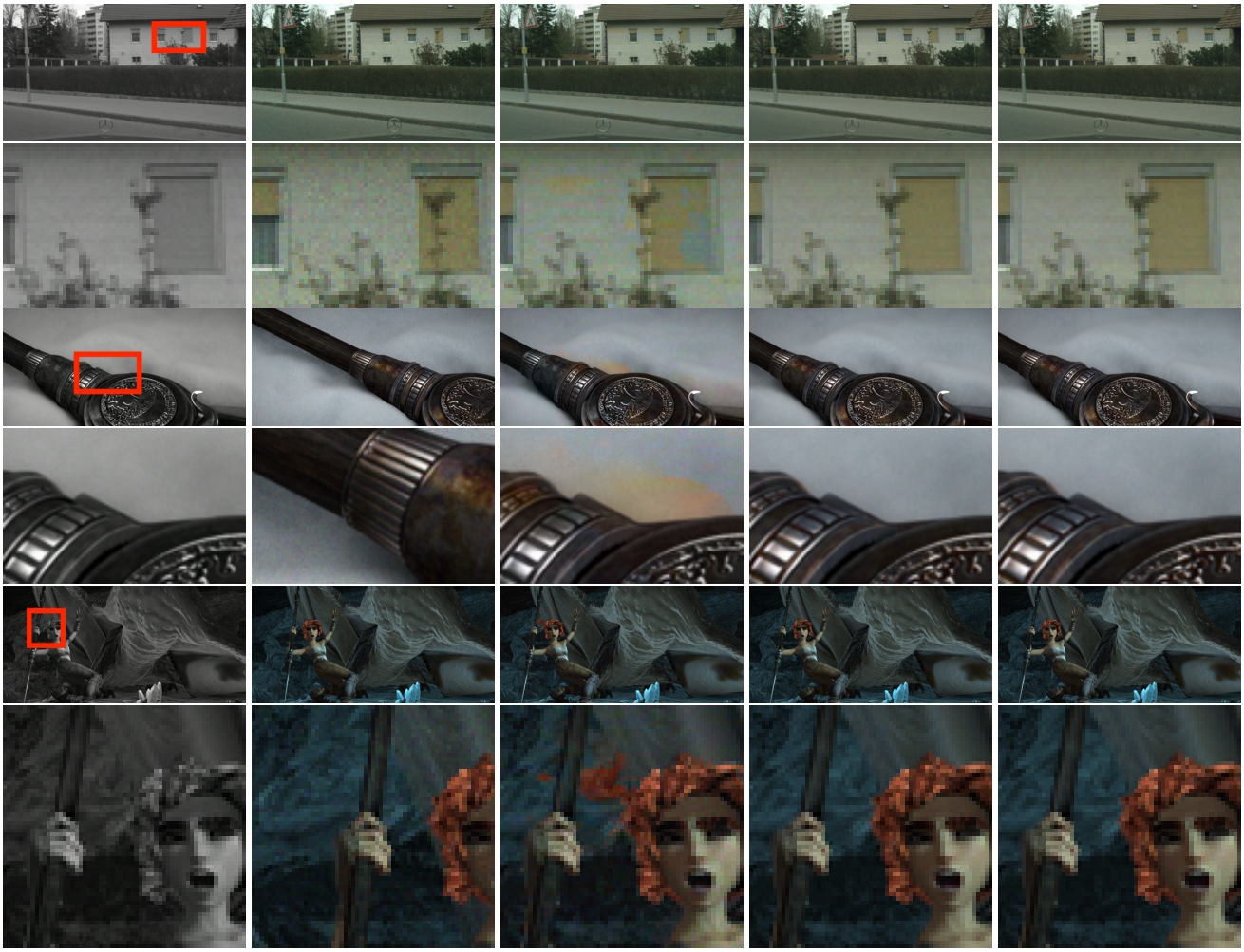
(a) The input pair of grayscale and color images. (b) Result of Welsh et.al. (c) Result of Ironi et.al. (d) Result of Gupta et.al. (e) Our result. (f) Ground truth.

Figure 2: Examples to compare the colorization results of Welsh et. al.'s method, Ironi et. al.'s method, Gupta et. al.'s method, and our colorization method. The marked region with red box is shown in the following rows. As shown, the comparison methods fail to recover correct colors at the marked region while our results have correct colors.



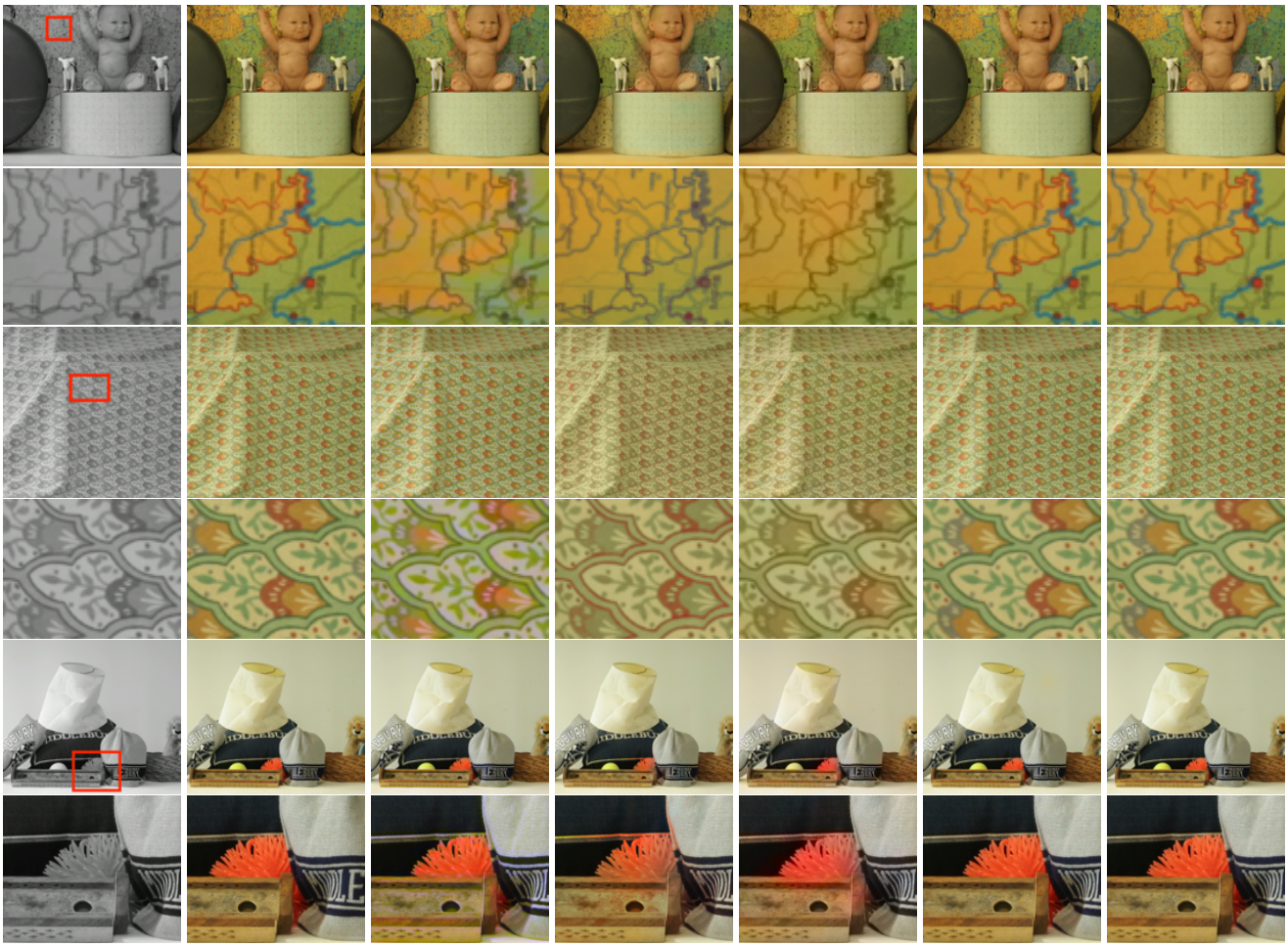
(a) The input pair of grayscale and color images. (b) Result of Jeon et.al. (c) Our result. (d) Ground truth.

Figure 3: Examples to compare the colorization results of Jeon et. al.'s method and our colorization method. The marked region with red box is shown in the following rows. As shown, Jeon et. al.'s method fails to recover correct colors at the marked region while our results have correct colors.



(a) The input pair of grayscale and color images. (b) Result of Dong et.al. (c) Our result. (d) Ground truth.

Figure 4: Examples to compare the colorization results of Dong et. al.'s method and our colorization method. The marked region with red box is shown in the following rows. As shown, Dong et. al.'s method fails to recover correct colors at the marked region while our results have correct colors.



(a) The input pair of grayscale and color images. (b) Result of Khamis et al. (c) Result of Chen et al. (d) Result of He et al. (e) Our result. (f) Ground truth.

Figure 5: Examples to compare the colorization results of the two-stage coarse-to-fine methods of Khamis et al. and Chen et al., the general reference-based colorization method of He et al., and our method.

(a) The input pair of grayscale and color images. (b) Result of Sun et al. (c) Our result. (d) Ground truth.

Figure 6: Examples to compare the colorization results of Sun et. al.'s method and our colorization method.