Recurrent Color Constancy
Supplementary Material

Yanlin Qian[1], Ke Chen[1,*], Jarno Nikkanen[2], Joni-Kristian Kämäräinen[1], Jiri Matas[1,3]
[1]Laboratory of Signal Processing, Tampere University of Technology
[2]Intel Finland
[3]Center for Machine Perception, Czech Technical University in Prague

1. Supplementary Material Description

Groundtruth Bias – We render all images in the linear SFU Gray Ball Dataset with respect to the linear groundtruth provided by the color constancy benchmarking website [1]. Among all rendered images, we find a number of these not in intrinsic color and not consistent in illumination with the preceding frames (Figure 1), which indicates the corresponding "groundtruth" is biased. The biased "groundtruth" makes our algorithm not accurately estimate the illumination, which is reflected in maximum angular error we reported in the main paper.

More Results – To better understand the superiority of our RCC-Net in temporal color constancy task, we collect some statistics (angular error and angle change) of illumination estimation for 20 five-frame sequences from the Gray Ball Dataset, of which 10 sequences (Figure 2) are with significant illumination change and the remainder (Figure 3) are with minor illumination change. It is easily observable that regardless of varying-illumination or constant-illumination conditions, our RCC-Net usually notably outperforms others. In addition, 6 samples of color correction by temporal methods are shown in Figure 4. Generally, corrected images using estimation given by the RCC-Net seems more similiar to the groundtruth image, compared to those images corrected using predicted illuminations from other temporal methods. Note that: for the sake of convenience, all experiments and results here are correspond to the linear version of the Gray Ball Dataset.

References

[1] A. Gijsenij. Color constancy research website: `http://colorconstancy.com`.

[2] A. Gijsenij, T. Gevers, and J. Van De Weijer. Generalized gamut mapping using image derivative structures for color constancy. *International Journal of Computer Vision*, 86(2-3):127–139, 2010.

[3] K.-F. Yang, S.-B. Gao, and Y.-J. Li. Efficient illuminant estimation for color constancy using grey pixels. In *CVPR*, 2015.

*Corresponding author

Figure 1. Two color-corrected sequences in which the illumination “groundtruth” for the last frame is obviously biased. *err* refers to the angular error given by our RCC-Net, and *t* is the index marking the position of the frame in the original long video which contain all images in SFU Gray Ball Dataset. The bias of the “groundtruth” is shown by the inconsistency of the pictorial content in consecutive frames.

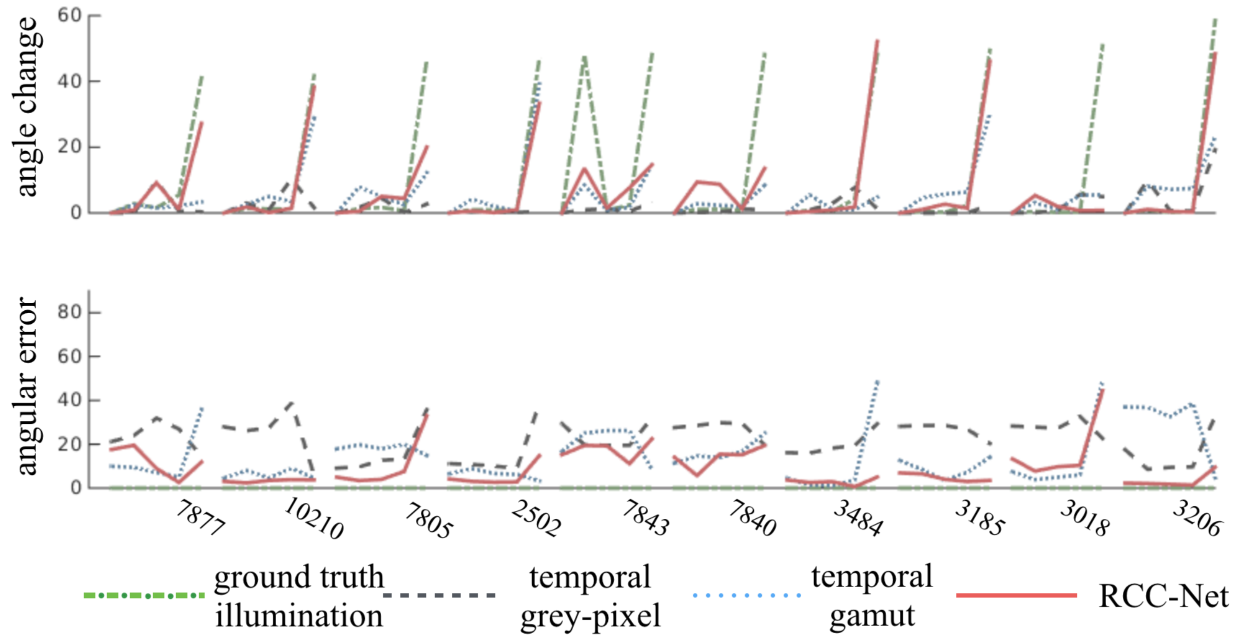

Figure 2. Ten five-frame sub-sequences from Temporal SFU Gray Ball with significant illumination change. Rapid illumination angle change mainly occurs in the last frame (see the ground truth graphs in the top row) which no method handles well. Top: the *angle change* between two consecutive frames $\sphericalangle(c_{t-1}, c_t)$, t is the index marking the position of the frame in the original video.

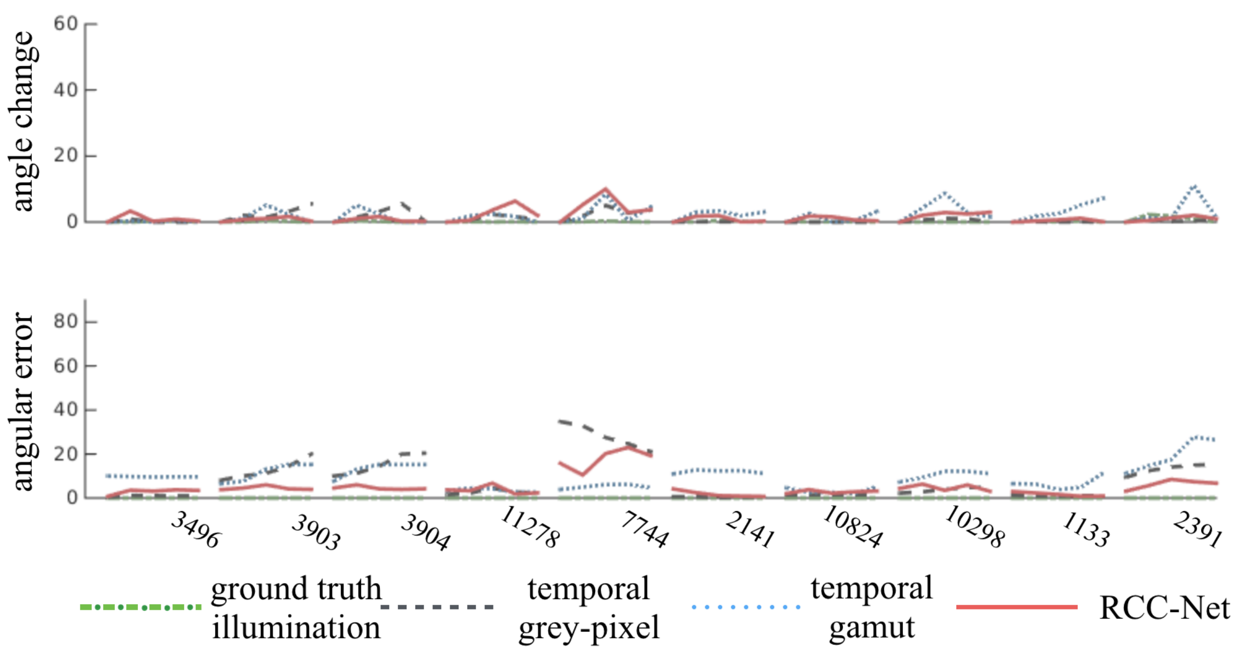

Figure 3. Ten five-frame sub-sequences from Temporal SFU Gray Ball with minor illumination change.

Figure 4. Color correction by temporal methods on image I_t using five-frame sequences with (the $\{1, 2, 3\}$st rows from the top) and without (the $\{4, 5, 6\}$st rows) significant content change, with (the $\{1, 3\}$st rows) and without (the $\{2, 4, 5, 6\}$st rows) significant illumination color change. RCC-Net is the proposed method. T.GM-edge and T.GP refer to temporal extension of the standard Gamut-based [2] and Gray Pixel [3] methods, respectively. Illumination color change is visible on the ball in the bottom right corner. The angular error is shown on the right of each color-corrected image. Note that the images in the dataset are linear, *i.e.* without gamma correction and thus appear to have unusual color composition.