REVISITING IMAGE FUSION FOR MULTI-ILLUMINANT WHITE-BALANCE CORRECTION

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PAPER, CODE AND DATASET AVAILABLE

TRADITIONAL WB

Most autoWB modules assume a single light source is present per scene. However, most real scenes often have multiple lighting conditions.

MOTIVATION

Previous methods[1,2] propose rendering the RAW image into a set of predefined illuminants (WB presets) and blend them linearly. A CNN-based model estimates a probability weight map for each preset.

However, linearly blending the presets is inherently constrained as the white-balanced image often lies outside the preset's convex hull.

In RenderedWB[3], more than 99% of the pixels lie outside the convex hull.

Efficient Non-Linear Blending of WB Presets for Multi-Illuminant Color Correction

METHOD

We introduce a simple and efficient method to blend the different WB presets non-linearly. It consists of a Transformer Block with a channel-wise attention mechanism.

Our method has only 7.9k parameters and processes one 720p image under 0.2 seconds.

DATASET

We repurpose the LSMI dataset[4] for image fusion in multi-illuminant white balance (WB). This dataset contains images captured under one, two, and three illuminants. We render the images using the WB presets and apply the following three-step process to obtain the ground-truth images.

EXPERIMENTS & RESULTS

Our method outperforms prior state of the art on single- and multi-illuminant datasets, achieving superior color correction.

Quantitative comparison between linear blending methods and our approach on the combined two splits of our dataset.

	ΔE2000			MSE			MAE		
Method	Mean	Median	Trimean	Mean	Median	Trimean	Mean	Median	Trimean
Kınlı et al.[2]	9.67	8.96	9.13	234.32	170.38	190.59	7.92	7.41	7.59
Afifi et al.[1]	9.31	8.45	8.65	219.51	148.71	162.40	6.36	5.60	5.72
Ours	**4.55**	**4.45**	**4.37**	**75.60**	**46.88**	**49.08**	**3.61**	**3.37**	**3.33**

The Transformer block removes color casts from multiple illuminants more effectively than other RGB-based WB methods and linear blending approaches:

Concatenating five WB presets with channel attention yields superior performance compared to using a single sRGB image, while maintaining computational efficiency.

[1]Afifi et al. Auto white-balance correction for mixed-illuminant scenes. In WACV, 2022. [2]Kınlı et al. Modeling the lighting in scenes as style for auto white-balance correction. In WACV, 2023. [3]Afifi et al. When color constancy goes wrong: Correcting improperly white-balanced images. In CVPR, 2019. [4]Kim et al. Large scale multi-illuminant dataset for developing white balance algorithm under mixed illumination. In ICCV, 2021. [5]Afifi & Brown. Deep white-balance editing. In CVPR, 2020.