

Low-light Images Haze Removal

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Motivation

- images captured under low light condition in a hazy scene
- Few algorithms and processing pipelines to increase the visibility for low-light hazy images
- We propose a new **image post-processing pipeline** to dehaze the image captured under low-light hazy scenes

Background & Related Work

$$I(x) = J(x)t(x) + A(1 - t(x)) \quad [1]$$

I: observed intensity (Hazy Image)

J: scene radiance

A: global atmospheric light

t: medium transmission

Haze Removal Goal:

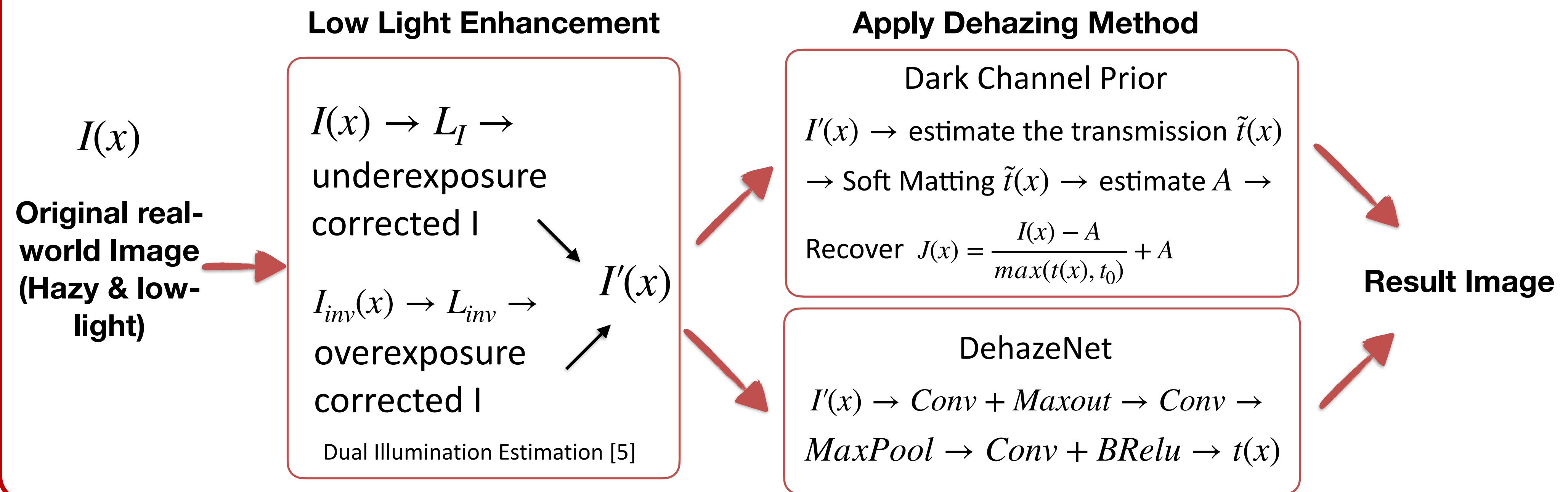
recover J, A, and t from I.

- Day-time image dehaze (outdoor / indoor)
 - Prior (Dark Channel [1] / Color Attenuation)
 - Deep-learning based (CNN: DehazeNet [4])
- Night-time image dehaze
 - Filtering-based (separate glow from image) [2]

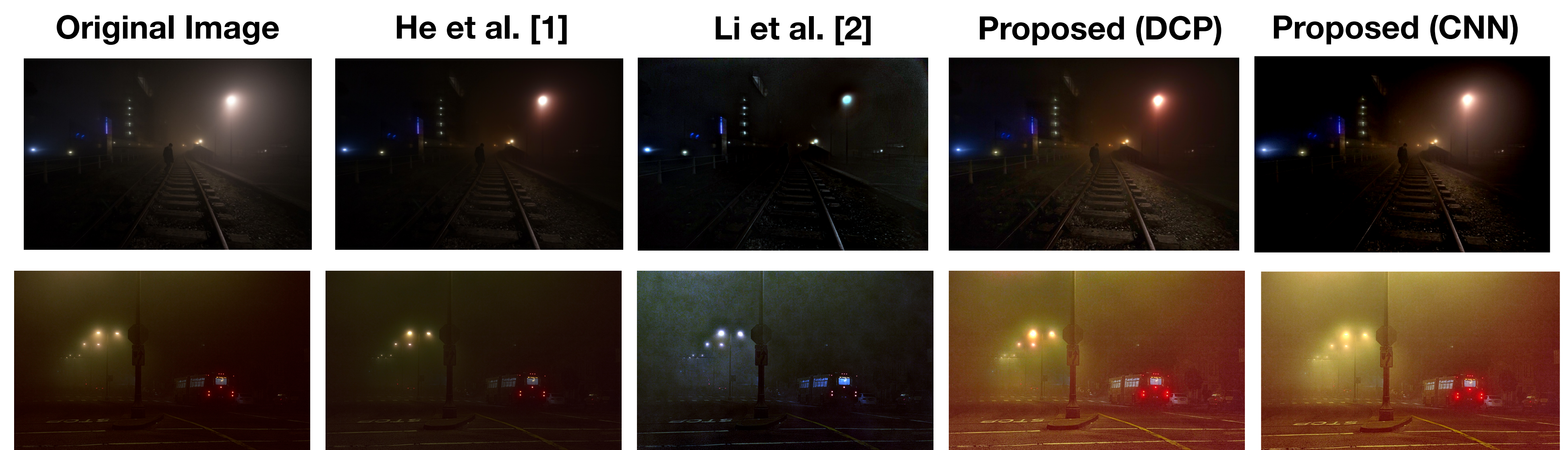
References

- [1] K. He, J. Sun and X. Tang, "Single image haze removal using dark channel prior," *CVPR*, 2009.
- [2] Y. Li, R. T. Tan and M. S. Brown, "Nighttime Haze Removal with Glow and Multiple Light Colors," *ICCV*, 2015.
- [3] L. K. Choi, J. You and A. C. Bovik, "Referenceless Prediction of Perceptual Fog Density and Perceptual Image Defogging," *IEEE Trans Image Process*, 2015.
- [4] B. Cai, X. Xu, K. Jia, C. Qing, D. Tao, "DehazeNet: An End-to-End System for Single Image Haze Removal", *IEEE Trans Image Process*, 2016.
- [5] Q. Zhang, Y. Nie, W. Zheng, "Dual Illumination Estimation for Robust Exposure Correction", *Pacific Graphics*, 2019.

Processing Pipeline



Qualitative Results



Quantitative Results

	Original Image	He et al. [1]	Li et al. [2]	Proposed (DCP)	Proposed (CNN)
FADE [3]	0.7479	0.6591	0.2752	0.5406	0.2681
BRISQUE (Matlab built-in)	36.7298	35.8072	28.1834	22.7432	46.1784