RefineDNet: A Weakly Supervised Refinement Framework for Single Image Dehazing

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Abstract Haze-free images are the prerequisites of many vision systems and algorithms, and thus single image dehazing is of paramount importance in computer vision. In this field, prior-based methods have achieved initial success. However, they often introduce annoying artifacts to outputs because their priors can hardly fit all situations. By contrast, learning-based methods can generate more natural results. Nonetheless, due to the lack of paired foggy and clear outdoor images of the same scenes as training samples, their haze removal abilities are limited. In this work, we attempt to merge the merits of prior-based and learning-based approaches by dividing the dehazing task into two sub-tasks, i.e., visibility restoration and realness improvement. Specifically, we propose a two-stage weakly supervised dehazing framework, RefineDNet. In the first stage, RefineDNet adopts the dark channel prior to restore visibility. Then, in the second stage, it refines preliminary dehazing results of the first stage to improve realness via adversarial learning with unpaired foggy and clear images. To get more qualified results, we also propose an effective perceptual fusion strategy to blend different dehazing outputs. Extensive experiments corroborate that RefineDNet with the perceptual fusion has an outstanding haze removal capability and can also produce visually pleasing results. Even implemented with basic backbone networks, RefineDNet can outperform supervised dehazing approaches as well as other state-of-the-art methods on indoor and outdoor datasets. To make our results reproducible, relevant code and data are available at https://github.com/xiaofeng94/RefineDNet-for-dehazing.

Keywords **Author Keywords:** Training; Image restoration; Learning systems; Gallium nitride; Atmospheric modeling; Image color analysis; Generative adversarial networks; Single image dehazing; weak supervision; image fusion; unpaired dehazing dataset

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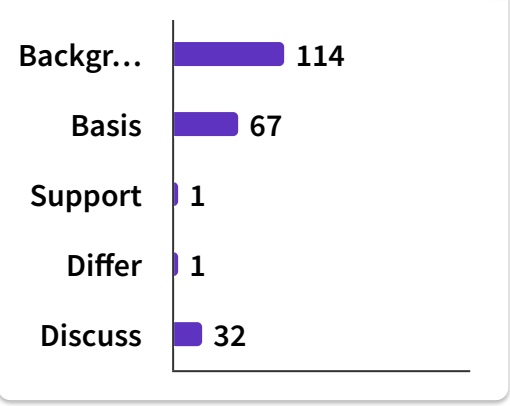

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