

Supplementary Materials: P-BiC: Ultra-High-Definition Image Moiré Patterns Removal via Patch Bilateral Compensation

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OVERVIEW

This supplementary document is organized as follows:

Section 1 provides detailed structures of the feature encoder and the feature decoder.

Section 2 provides the details of the fusion operation in the Green-Guided Detail Transfer Module.

Section 3 provides more visual results.

1 STRUCTURES OF THE FEATURE ENCODER AND THE FEATURE DECODER

Here we show the detailed structures of the feature extractor and the feature decoder in Figure 1. Note that, to extract features with different representations, the feature encoders used to extract multi-scale moire image features, and green channel features do not share weights. The residual blocks used as building blocks in the encoders and decoders can be readily replaced by other advanced embodiment for better performance.

2 THE FUSION OPERATION IN THE GREEN-GUIDED DETAIL TRANSFER MODULE

In Figure 2, we show the detailed structure of the fusion operation in the green-guided detail transfer (G^2DT) module.

As can be seen in the figure, after we convert the rescaled green-channel image $I^{G\downarrow}$ to the feature domain, $F^{G\downarrow}$ and $F'_{3,i}$ are fed to the fusion operation. Inspired by the self-attention operation, in which the queries (Q), keys (K) and values (V) all come from the same input, the fusion operation first extracts the queries Q_F from $F^{G\downarrow}$, and the keys K_G and values V_G from $F'_{3,i}$, as shown in Figure 1. $F'_{3,i}$ and $F^{G\downarrow}$ are fed to normalization and 1×1 convolutional layers, where the latter have c output channels. We then apply the attention operation between vectorized features via

$$\text{Attention}(Q_F, K_F, V_G) = V_G \cdot \text{softmax}\left(\frac{Q_F^T K_G}{\sqrt{d_k}}\right). \quad (1)$$

Note that the soft indexing of K_F by Q_F is performed at the channel dimension instead of the spatial dimensions. Thus the computational costs of soft attention map in Equ. 1 is $O(C^2)$ rather than $O(h^2 w^2)$, making the operation feasible even for features with high spatial resolution. h and w are the spatial resolutions. The output of the attention operation is added to the input image feature and is fed to a multi-layer perceptron (MLP) consisting of two fully connected layers with the GELU operation in between, obtaining the final fused feature $F_{3,i}^{G^2DT}$.

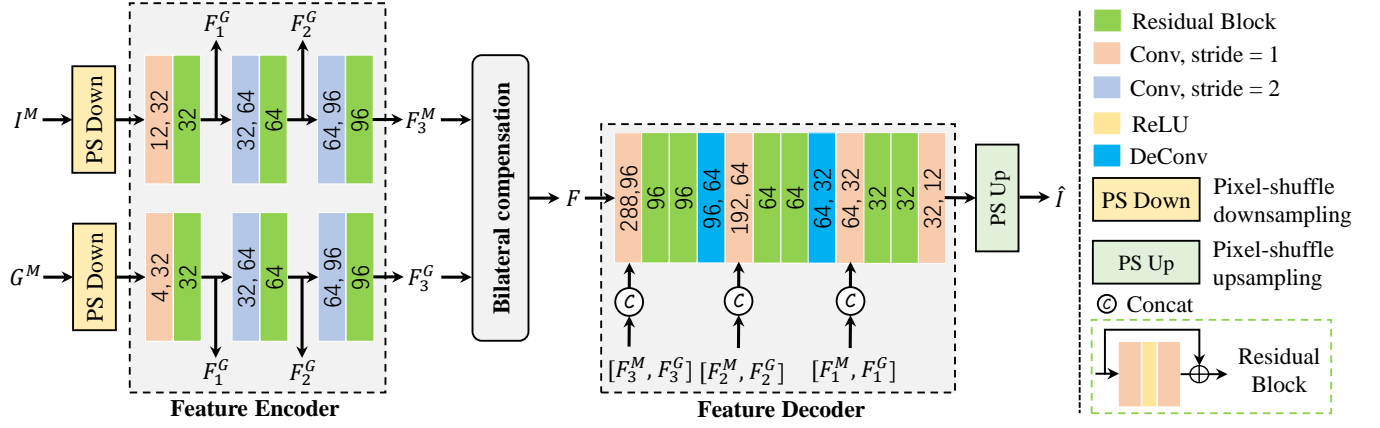


Figure 1: The structure of the feature encoder and the feature decoder, with the input and output channel numbers.

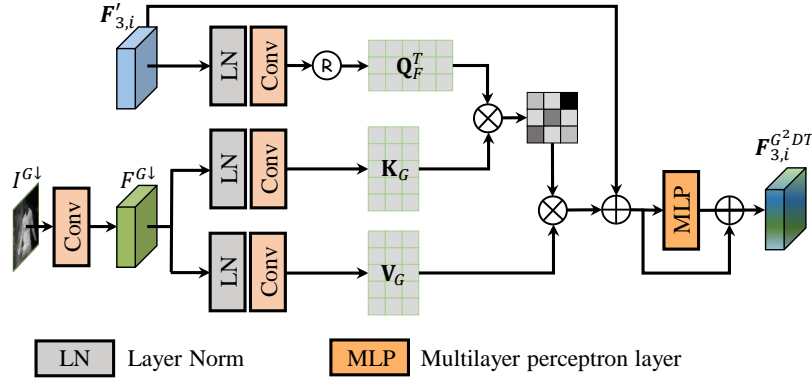


Figure 2: The structure of the fusion operation in the G^2DT module.

3 MORE EXPERIMENTAL RESULTS

We show the visual comparisons of the proposed P-BiC, together with several state-of-the-art image demoiré methods, including DMCNN [5], MDDM [1], WDNNet [4], MopNet [2], MBCNN [7], FHDe²Net [3], ESDNet and ESDNet-L [6], in which ESDNet-L is a larger version. As we can see, P-BiC can generate precise details and correct tones, thereby resulting in more perceptually satisfactory moiré-free results.

REFERENCES

- [1] Xi Cheng, Zhenyong Fu, and Jian Yang. 2019. Multi-scale dynamic feature encoding network for image demoiré. In *Int. Conf. Comput. Vis. Worksh.* 3486–3493.
- [2] Bin He, Ce Wang, Boxin Shi, and Ling-Yu Duan. 2019. Mop moiré patterns using mopnet. In *Int. Conf. Comput. Vis.* 2424–2432.
- [3] Bin He, Ce Wang, Boxin Shi, and Ling-Yu Duan. 2020. Fhde 2 net: Full high definition demoiréing network. In *Eur. Conf. Comput. Vis.* 713–729.
- [4] Lin Liu, Jianzhuang Liu, Shanxin Yuan, Gregory Slabaugh, Aleš Leonardis, Wengang Zhou, and Qi Tian. 2020. Wavelet-based dual-branch network for image demoiré. In *Eur. Conf. Comput. Vis.* 86–102.
- [5] Yujing Sun, Yizhou Yu, and Wenping Wang. 2018. Moiré photo restoration using multiresolution convolutional neural networks. *IEEE Trans. Image Process.* 27, 8 (2018), 4160–4172.
- [6] Xin Yu, Peng Dai, Wenbo Li, Lan Ma, Jiajun Shen, Jia Li, and Xiaojuan Qi. 2022. Towards efficient and scale-robust ultra-high-definition image demoiré. In *Eur. Conf. Comput. Vis.* 646–662.

- [7] Bolun Zheng, Shanxin Yuan, Gregory Slabaugh, and Ales Leonardis. 2020. Image demoiréing with learnable bandpass filters. In *IEEE Conf. Comput. Vis. Pattern Recog.* 3636–3645.

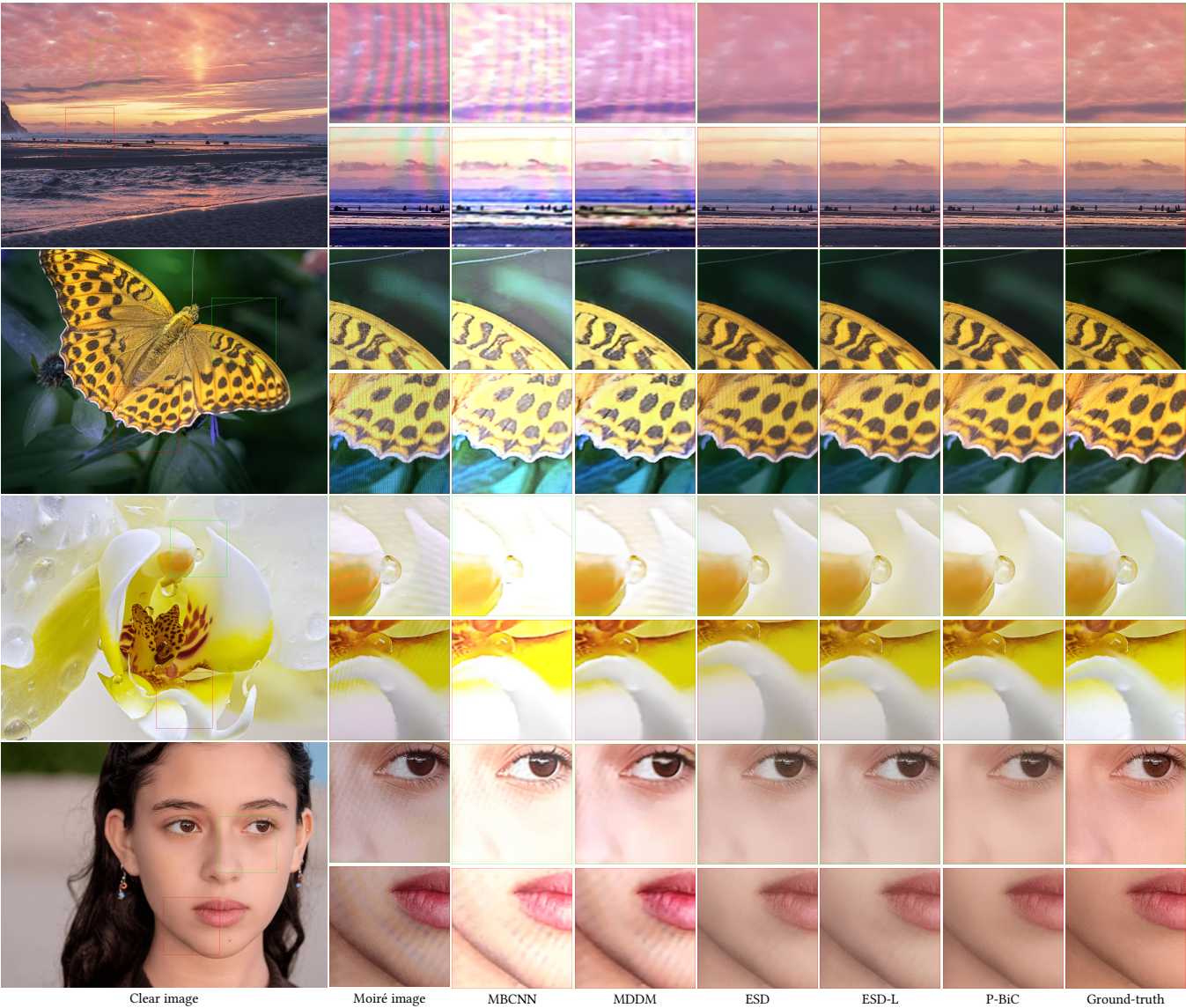


Figure 3: Qualitative comparisons with state-of-the-art methods on the UHDM dataset. Please zoom in and best viewed on screen.