SUPPLEMENTARY MATERIAL: CPDDNET: COLOR-POLARIZATION DENOISING AND DEMOSAICKING NETWORK

Qihang Zhang[1,2] *Yusuke Monno*[1] *Masayuki Tanaka*[1] *Masatoshi Okutomi*[1]

[1] Institute of Science Tokyo [2] The Chinese University of Hong Kong, Shenzhen

1. MODEL COMPLEXITY

Table 1 reports the parameter count and FLOPs of the compared pipelines under a batch size of 1 and an input RAW resolution of 768×1024. The FLOPs are measured on the real forward path. Our CPDDNet has the largest parameter count because it combines a raw-domain denoising module with the fusion-based demosaicking network. However, its computational cost remains lower than the DM→DN pipeline.

The main reason is that FLOPs are determined not only by the number of parameters, but also by the spatial resolution at which each module operates. In CPDDNet, the denoising module is performed in the channel-separated RAW domain with a reduced spatial size of $16 \times 192 \times 256$, which is much cheaper than applying denoising after demosaicking at full-resolution RGB/polarization features. As a result, although our method uses more parameters overall, it still requires fewer FLOPs than the DM→DN pipeline.

Table 1. Model complexity comparison. FLOPs are measured with input size $1 \times 1 \times 768 \times 1024$.

Method	Parameters	FLOPs
DM	34.522M	3.854T
DN→DM	65.562M	3.924T
DM→DN	42.225M	4.707T
CPDDNet (Ours)	68.647M	4.415T

2. SCENE-WISE RESULTS

This section includes the visual comparisons for all five tested scenes, which cannot be included in the main paper due to limited space. Figures 1 to 5 from the next page show the results for the five scenes (Scenes 36–40), where our proposed method consistently produces the closest reconstructions to the ground truths, especially in the AoP–DoP visualization.

To complement the visual comparisons, we further summarize the scene-wise quantitative ranking over all evaluated methods. For each scene, we compare five methods over 17 metrics, including CPSNR and SSIM on the four polarization angles, the three Stokes components, and DoP, together with the AngleError of AoP. We assign the best metric credit to the top method for each metric. Under this criterion, our CPDDNet ranks the first in all five scenes, obtaining 17/17, 17/17, 16/17, 15/17, and 14/17 best-metric credits on Scenes 36–40, respectively.

Table 2. Scene-wise quantitative summary. "Credit" denotes the accumulated best-metric credit over the 17 evaluated metrics in each scene.

Scene	Top Method	Credit
Scene 36	CPDDNet (Ours)	17/17
Scene 37	CPDDNet (Ours)	17/17
Scene 38	CPDDNet (Ours)	16/17
Scene 39	CPDDNet (Ours)	15/17
Scene 40	CPDDNet (Ours)	14/17

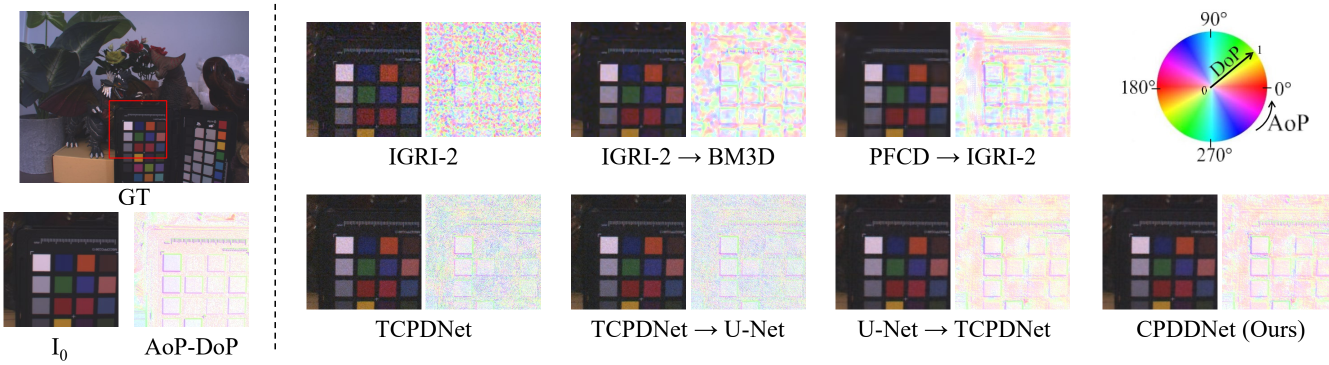

Fig. 1. Scene 36.

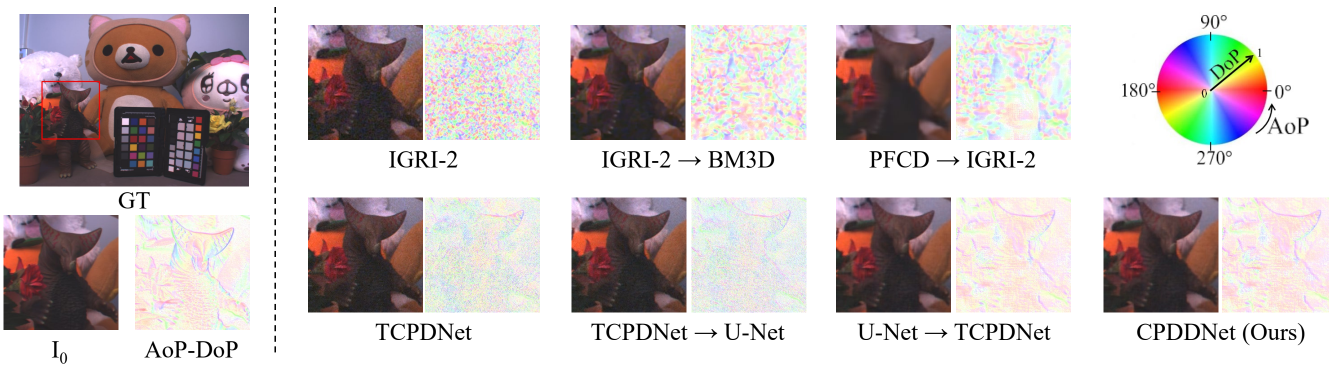

Fig. 2. Scene 37.

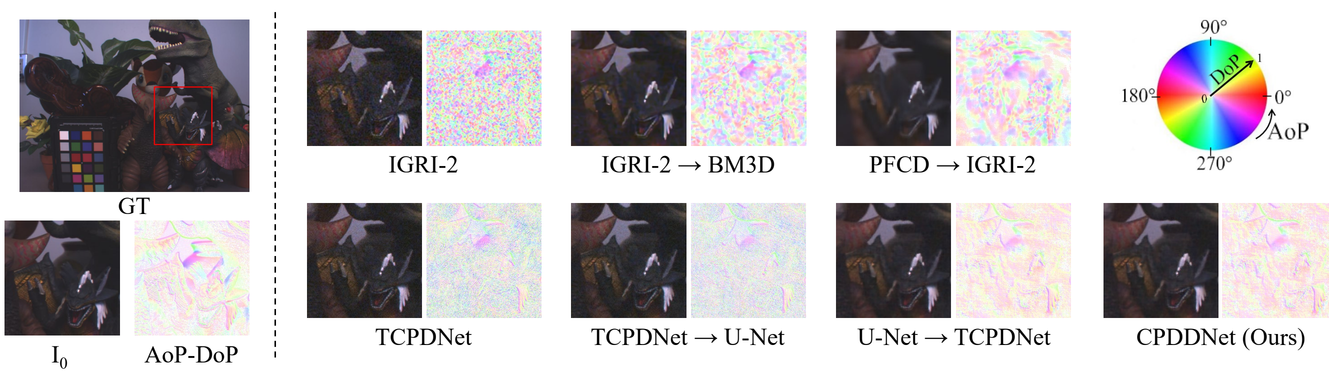

Fig. 3. Scene 38.

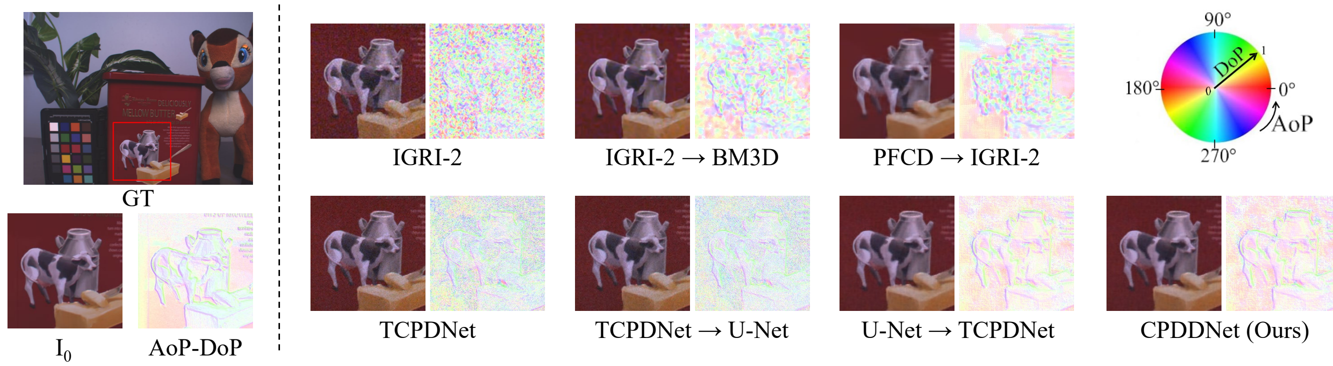

Fig. 4. Scene 39.

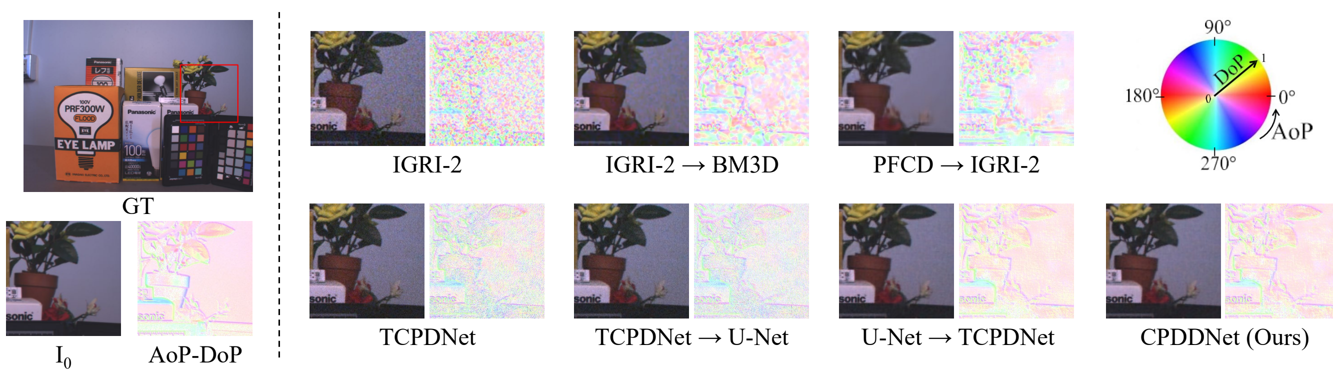

Fig. 5. Scene 40.