ICCV23
PARIS

Lens Parameter Estimation for Realistic Depth of Field Modeling

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https://lvsn.github.io/inversedof/ ← Demo available!

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Adobe

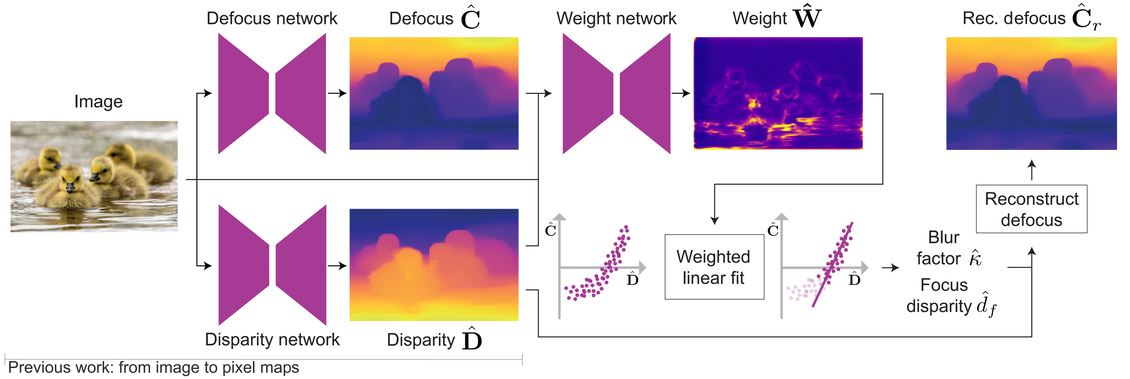
Motivation

We estimate the depth of field effect from single images.

Most related methods estimate a per-pixel map of depth and/or blur.

We propose to use a two-parameter **lens** model that enables novel applications, such as the realistic compositing of 3D objects in shallow DOF images.

Method



Quantitative results

State of the art results

		RMSE Defocus	MAE d_f	MAE κ		RMSE Disparity
Synthworld dataset	DMENet	12.98	0.150	17.12	MiDaS v2	0.186
	DBENet	12.97	0.182	15.99	MiDas v3	0.147
	DID-ANet	13.51	0.178	15.45	JDD	0.303
	JDD	15.85	0.641	44.44	Ours (petr.)	0.152
	Ours	**6.36**	**0.043**	**4.55**	**Ours**	**0.087**
BokehMe dataset	DMENet	11.13	0.161	24.66	MiDaS v2	0.190
	DBENet	11.79	0.175	26.48	MiDas v3	0.151
	DID-ANet	13.18	0.202	28.05	JDD	0.324
	JDD	19.05	0.307	51.60	Ours (petr.)	0.140
	Ours	**2.13**	**0.034**	**4.00**	**Ours**	**0.043**

Model

The relationship between the disparity d and signed defocus c_s is linear:

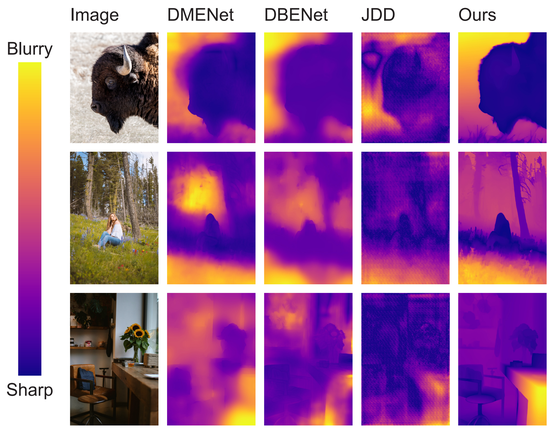
$$c_s = \kappa(d - d_f)$$

where d_f is the **disparity of focus**, and κ is the **blur factor** (representing the aperture multiplied by the focal length).

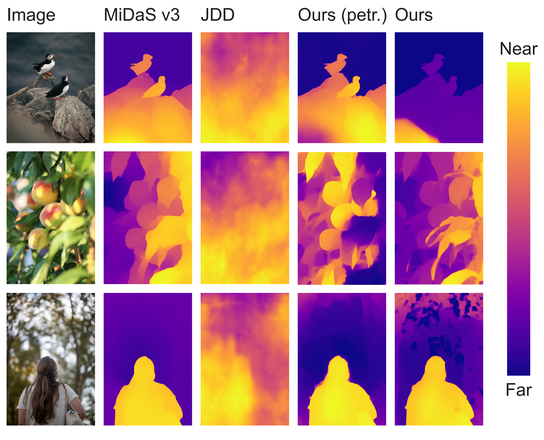
We recover the lens parameters κ and d_f from a single image, which model the depth of field of the whole scene.

Qualititave results

Defocus (in-the-wild)

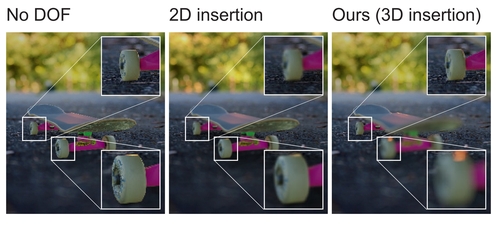


Diparity (in-the-wild)



Applications

3D objects insertion



2D insertion

Defocus