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Fast and Efficient Network for Field Disparity Estimation

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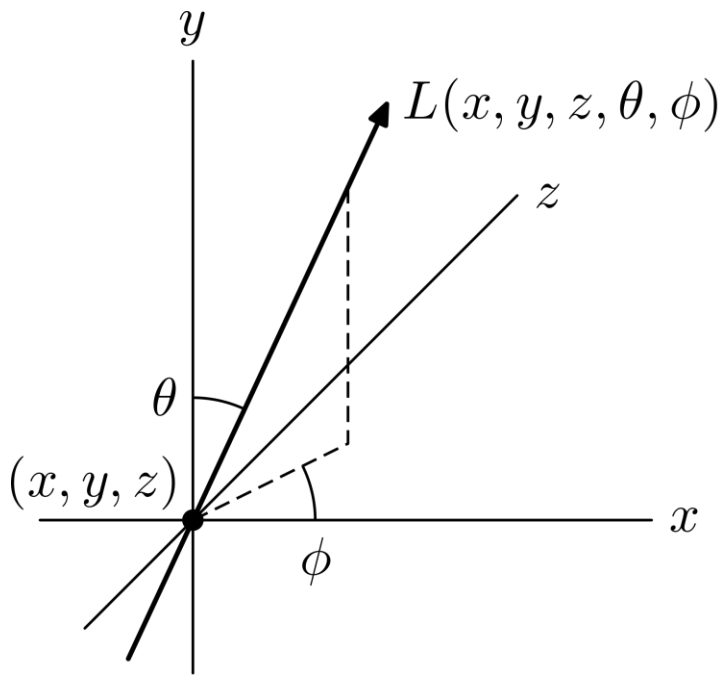
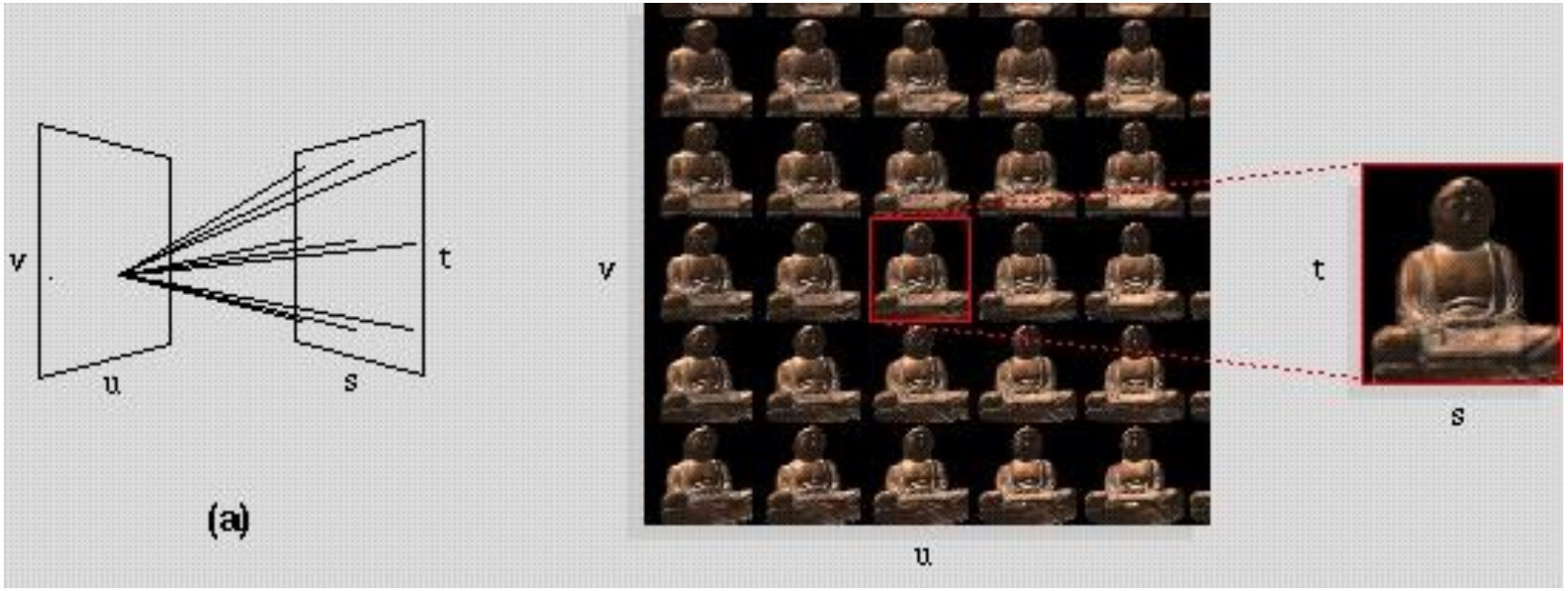
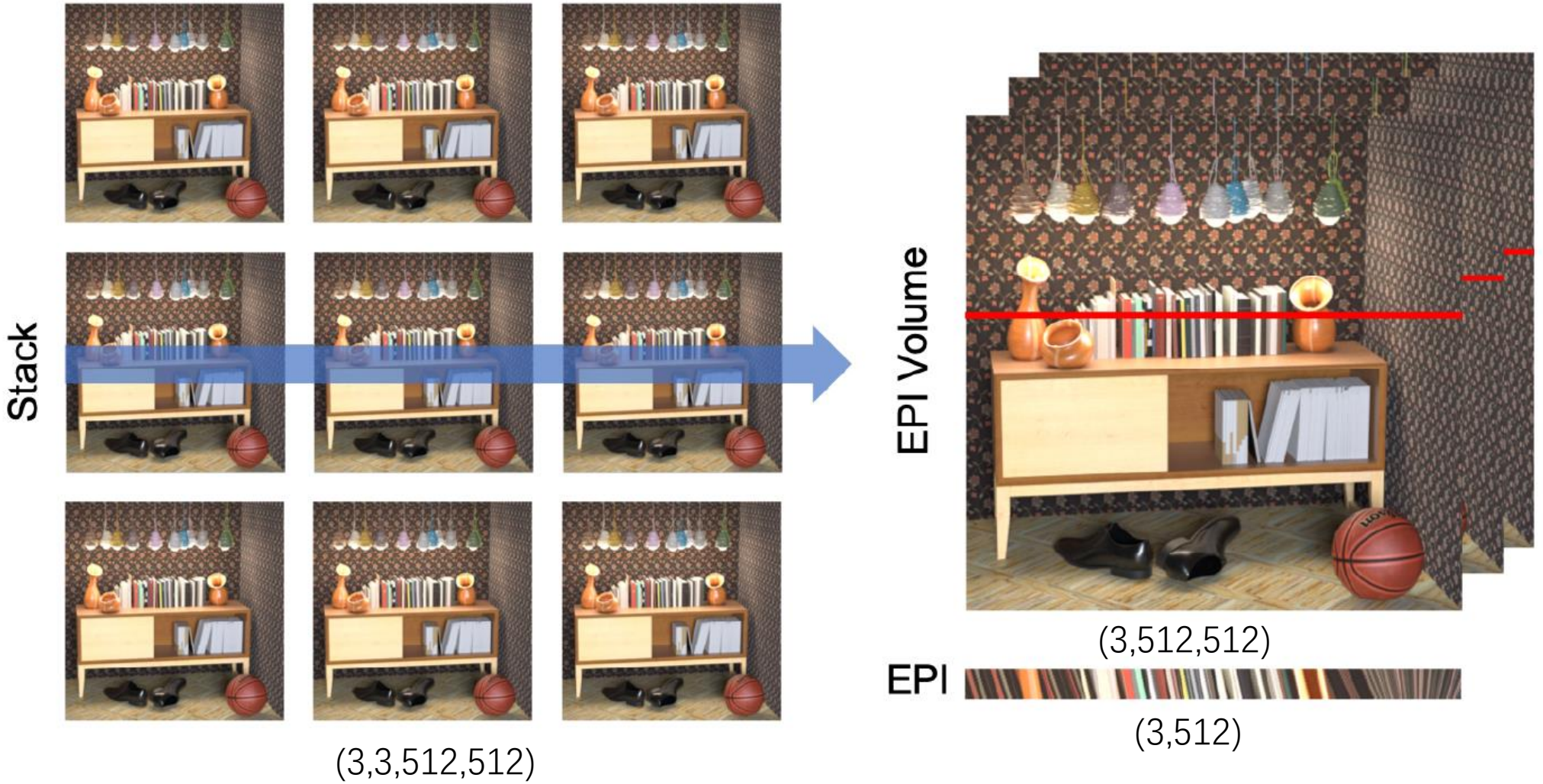
Light Field Imaging

- Ideally, 5D Plenoptic Function: $\mathrm{L}(x, y, z, \theta, \phi)$.
- In reality, 2D array of 2D image $I(u, v, s, t)$.

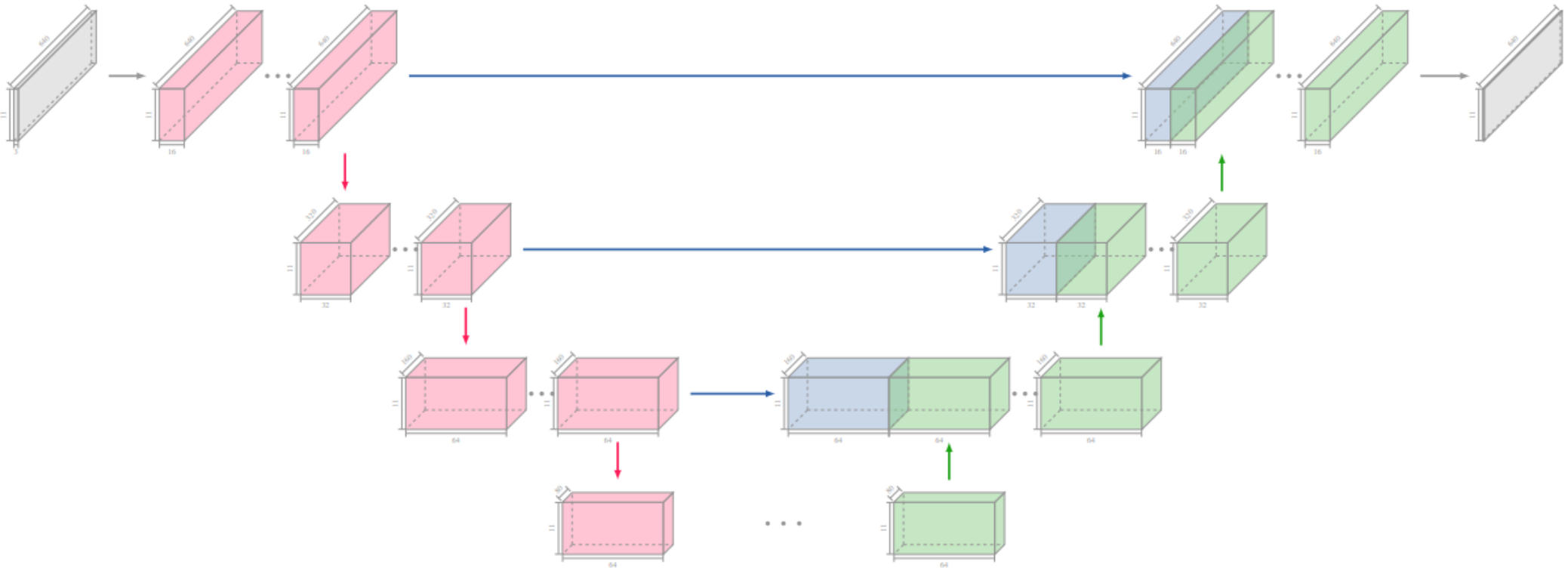




Light Field Disparity Estimation: EPI (epipolar plane image) and EPI volumns

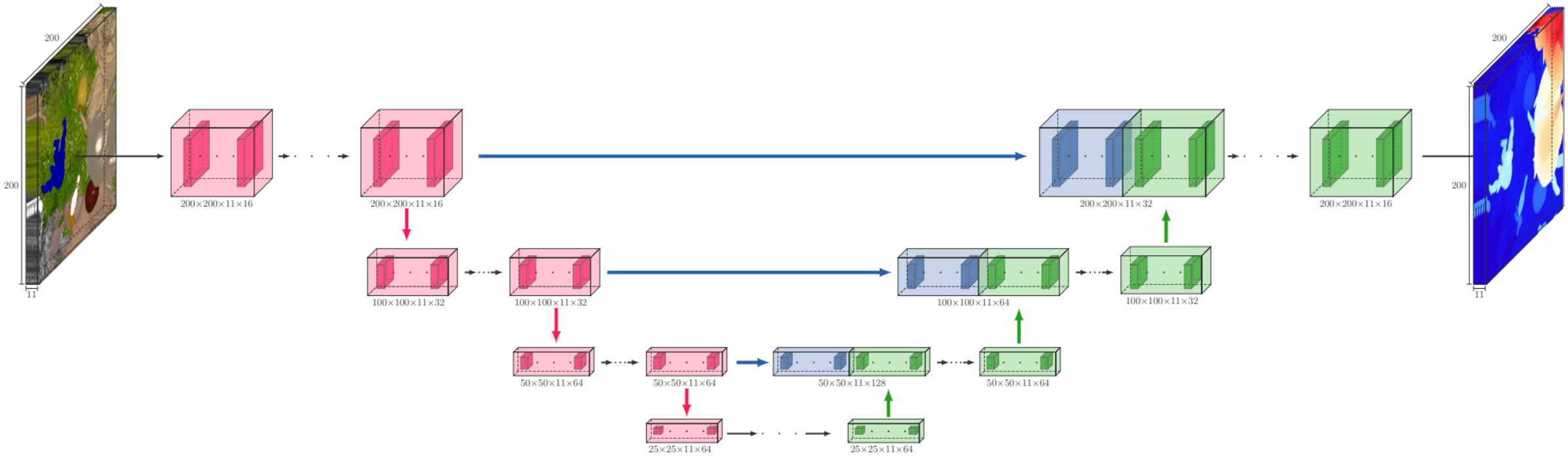


Light Field Disparity Estimation: From EPI to EPI Volumes



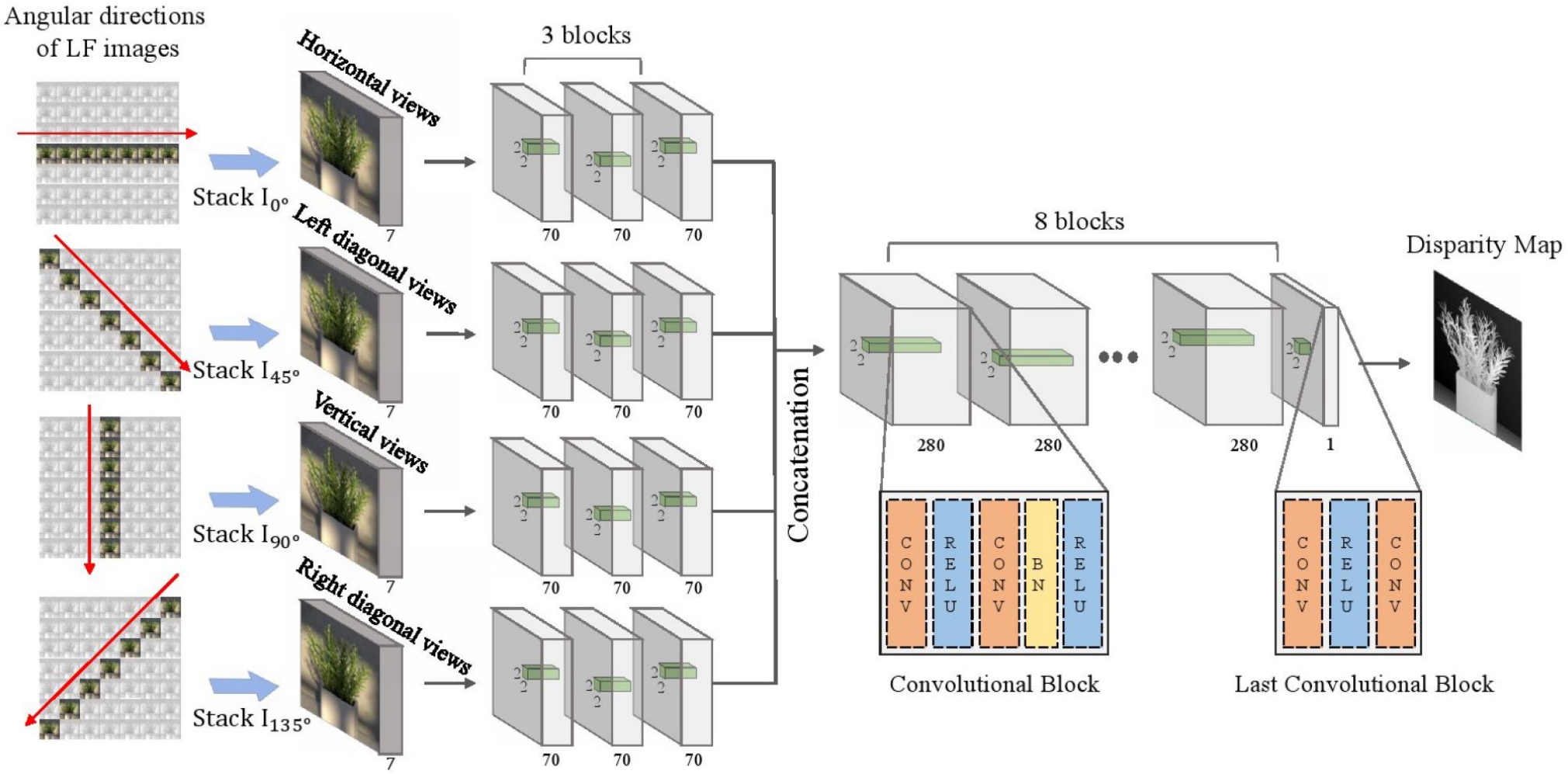
Heber, Stefan, Wei Yu and T. Pock. “U-shaped Networks for Shape from Light Field.” *BMVC* (2016).

Light Field Disparity Estimation: From EPI to EPI Volumes



Heber, Stefan, Wei Yu and T. Pock. “Neural EPI-Volume Networks for Shape from Light Field.” *2017 IEEE International Conference on Computer Vision (ICCV)* (2017): 2271-2279.

Light Field Disparity Estimation: From EPI to EPI Volumes



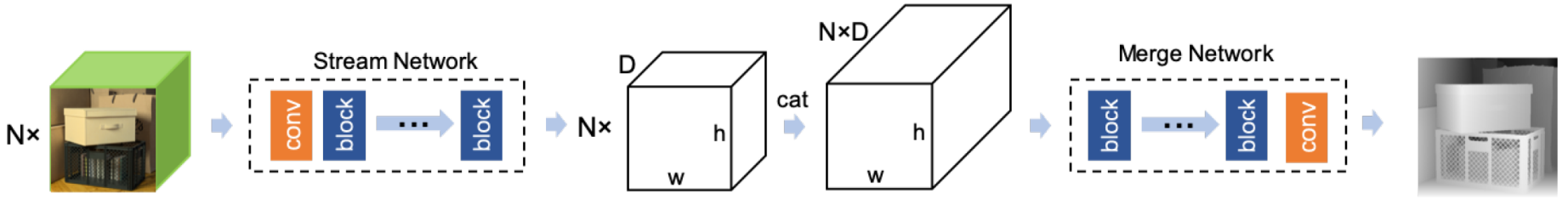
Shin, Changha, H. Jeon, Youngjin Yoon, In-So Kweon and S. Kim. “EPINET: A Fully-Convolutional Neural Network Using Epipolar Geometry for Depth from Light Field Images.” *2018 IEEE/CVF Conference on Computer Vision and Pattern Recognition* (2018): 4748-4757.

Fast and Efficient Network (FEN)

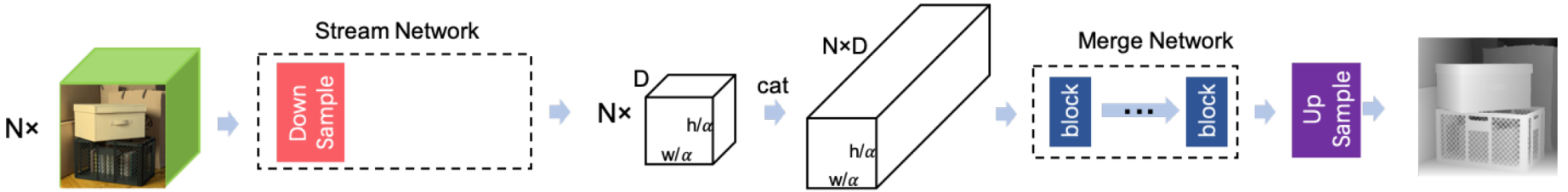
- Separable convolution block.
- Pruned stream network.
- Down scale input.

TABLE IV
COMPARISON OF SIZE AND COMPUTATION COST.

	# Params	MAdds
EPINET	5.1M	2.6T
FEN_A	1.5M	1.6T
FEN_B_×2	1.3M	175.0G
FEN_B_×4	1.4M	52.5G

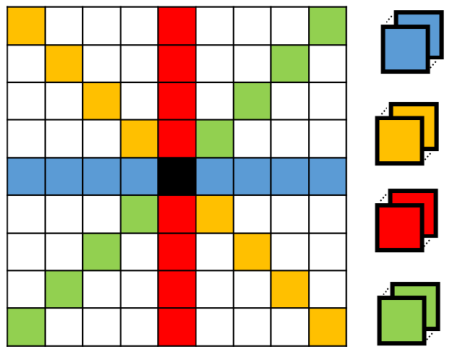


(a) FEN_A

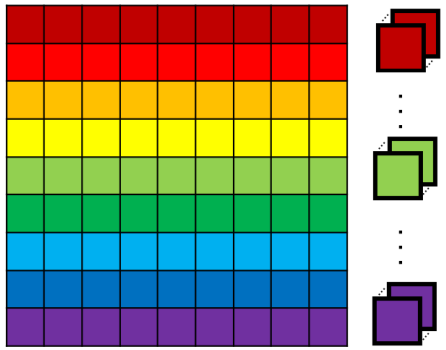


(b) FEN_B

Dense EPI Volumes



(a) 4 EPI input

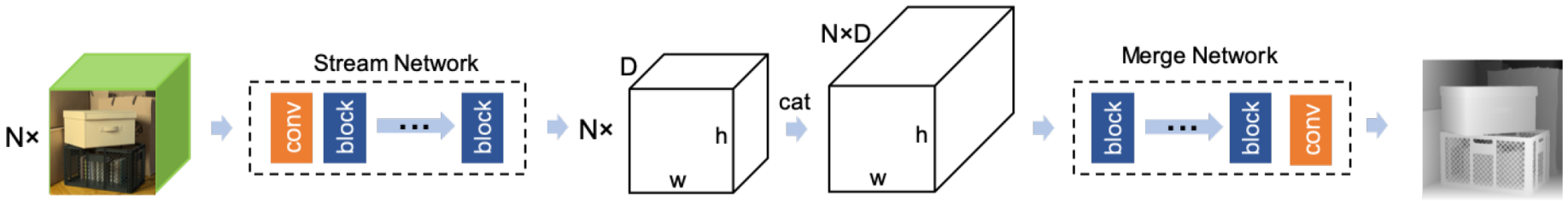


(b) 9 EPI input

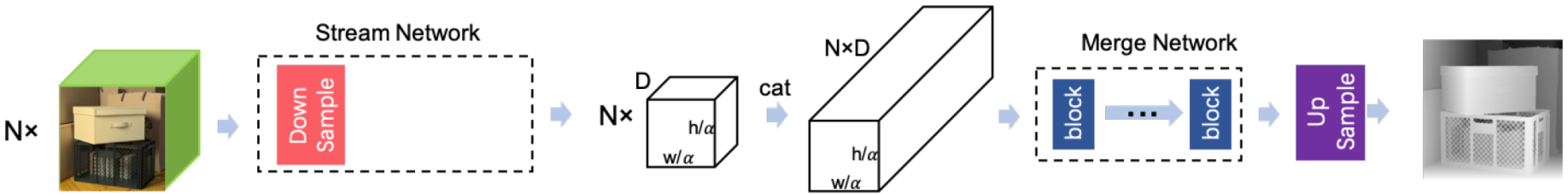
TABLE III

INPUT ABLATION STUDY, OVER *training* AND *stratified* SCENES. ON BOTH FEN_A AND FEN_B, THE PROPOSED INPUT PROVIDE A BETTER PERFORMANCE.

	BP007	MSE	MAdds
FEN_A	5.39	1.74	1.6T
FEN_A_4v	7.10	2.13	1.0T
FEN_B_×2	5.99	2.23	175.0G
FEN_B_×2_4v	8.09	2.46	173.8G



(a) FEN_A

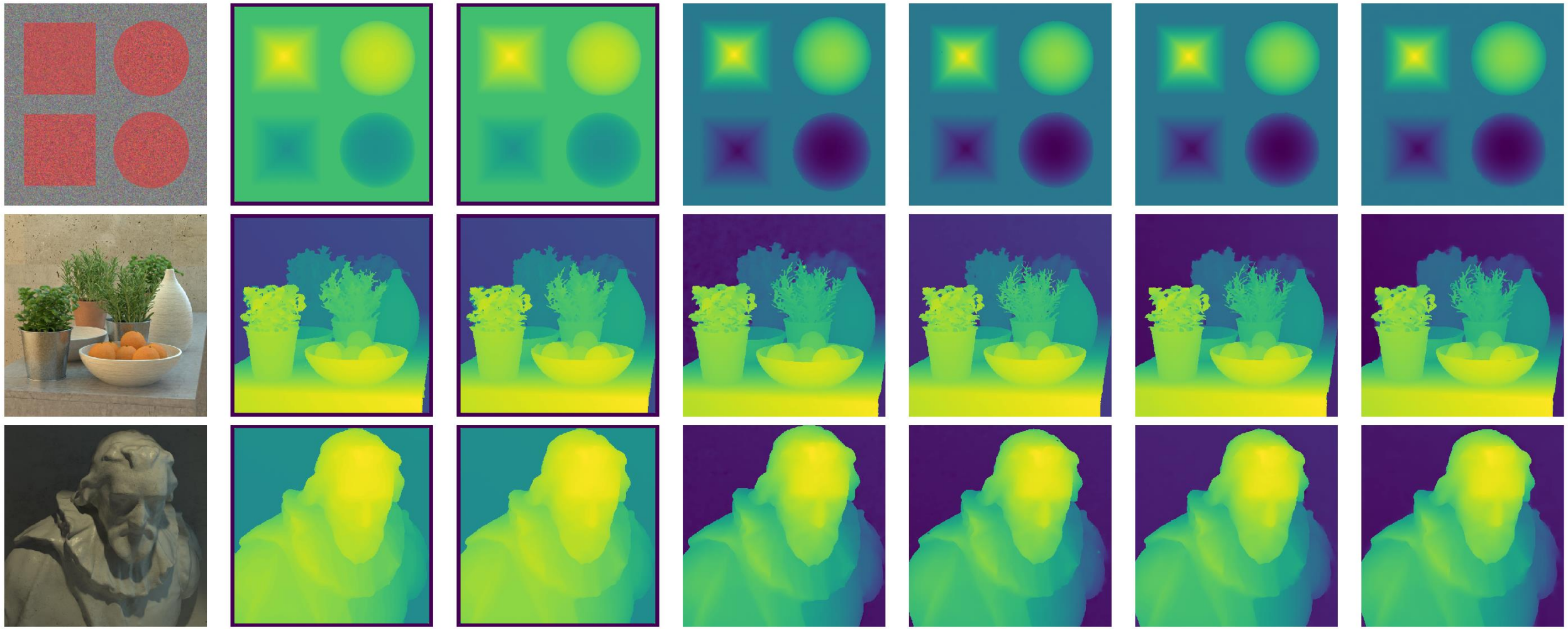


(b) FEN_B

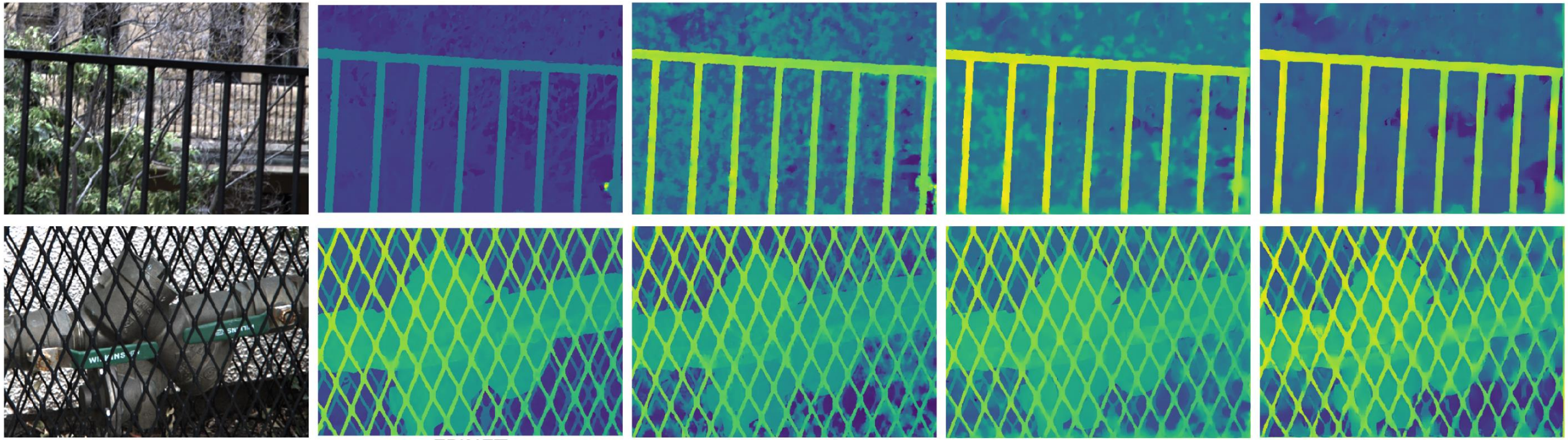
HCI Results (**best**)

method	BP0.07	MSE	Runtime	GPU
SPO-MO	5.71	3.52	4303.33	-
OBER-cross+ANP	**4.59**	2.58	182.99	-
FocalStackNet	5.26	5.24	88.19	Titan X
FusionNet	4.67	3.47	303.51	Titan X
EPINET	5.41	2.52	2.04	1080 Ti
FEN_A (ours)	6.03	**2.19**	2.00	
FEN_B_×2 (ours)	6.84	2.72	0.17	1070 Ti
FEN_B_×4 (ours)	9.18	3.17	**0.06**	

Visual Results



Visual Results



Conclusions

- Proposed a fast and efficient network for light field disparity estimation;
- Presented dense EPI volumes as input; and
- Achieved similar performance with much faster runtime compared with SOTA methods.