Supplementary Materials to Deep Spatial-angular Regularization for Compressive Light Field Reconstruction over Coded Apertures

In this document, we provide supplementary information to our paper "Deep Spatial-angular Regularization for Compressive Light Field Reconstruction over Coded Apertures". Contents in this documents are:

1) Section 1 gives the details of employed training and testing data.
2) Section 2 gives the detailed quantitative evaluation result for each testing data. In our paper, Fig. 3 shows the quantitative comparisons of our method against other methods, including Inagaki *et al.* [2], Kalantari *et al.* [3], and Yeung *et al.* [5], on real-world light field (LF) dataset. The PSNR/SSIM values refer to the average of all 30 LF images from testing dataset Kalantari Lytro [3]. Here, the quantitative results of each LF image are listed. Specifically, the results of tasks $1 \rightarrow 49$, $2 \rightarrow 49$, and $4 \rightarrow 49$ are correspondingly listed in Tables 1, 2, and 3, respectively. In addition, as shown in Table 4, we also list the quantitative results of our method and Inagaki *et al.* [2] over the synthetic LF datasets on the task $2 \rightarrow 25$, which consists of 2 LFs from HCI [1] and 4 LFs from Inria [4].

1 Training and Testing Dataset Details

1.1 Training Dataset

The training dataset contains 100 real-world LF images from Kalantari Lytro [3], 22 synthetic LF images from HCI [1], and 33 synthetic LF images from Inria [4].

Kalantari Lytro [3]: *IMG_0288_eslf', 'IMG_0289_eslf', 'IMG_0359_eslf', 'IMG_0360_eslf', 'IMG_0466_eslf', 'IMG_0518_eslf', 'IMG_0575_eslf', 'IMG_0596_eslf', 'IMG_0681_eslf', 'IMG_0780_eslf', 'IMG_0820_eslf', 'IMG_1016_eslf', 'IMG_1410_eslf', 'IMG_1413_eslf', 'IMG_1414_eslf', 'IMG_1415_eslf', 'IMG_1416_eslf', 'IMG_1419_eslf', 'IMG_1469_eslf', 'IMG_1470_eslf', 'IMG_1471_eslf', 'IMG_1473_eslf', 'IMG_1474_eslf', 'IMG_1475_eslf', 'IMG_1476_eslf', 'IMG_1477_eslf', 'IMG_1478_eslf', 'IMG_1479_eslf', 'IMG_1480_eslf', 'IMG_1481_eslf', 'IMG_1482_eslf', 'IMG_1483_eslf', 'IMG_1484_eslf', 'IMG_1486_eslf', 'IMG_1487_eslf', 'IMG_1490_eslf', 'IMG_1499_eslf', 'IMG_1500_eslf', 'IMG_1501_eslf', 'IMG_1504_eslf', 'IMG_1505_eslf', 'IMG_1508_eslf', 'IMG_1509_eslf', 'IMG_1510_eslf', 'IMG_1511_eslf', 'IMG_1513_eslf', 'IMG_1514_eslf', 'IMG_1516_eslf', 'IMG_1522_eslf', 'IMG_1523_eslf', 'IMG_1527_eslf', 'IMG_1529_eslf', 'IMG_1530_eslf', 'IMG_1534_eslf', 'IMG_1538_eslf', 'IMG_1544_eslf', 'IMG_1546_eslf', 'IMG_1547_eslf', 'IMG_1560_eslf', 'IMG_1565_eslf', 'IMG_1566_eslf', 'IMG_1567_eslf', 'IMG_1568_eslf', 'IMG_1580_eslf', 'IMG_1582_eslf', 'IMG_1583_eslf', 'IMG_1594_eslf', 'IMG_1595_eslf', 'IMG_1598_eslf', 'IMG_1599_eslf',*

'IMG_1600_eslf', 'IMG_1601_eslf', 'bikes_11_eslf', 'bikes_12_eslf', 'bikes_13_eslf', 'bikes_20_eslf', 'bikes_4_eslf', 'bikes_9_eslf', 'buildings_10_eslf', 'buildings_3_eslf', 'buildings_6_eslf', 'cars_21_eslf', 'cars_36_eslf', 'cars_37_eslf', 'cars_38_eslf', 'cars_39_eslf', 'cars_44_eslf', 'cars_50_eslf', 'flowers_plants_17_eslf', 'flowers_plants_23_eslf', 'flowers_plants_24_eslf', 'flowers_plants_28_eslf', 'flowers_plants_42_eslf', 'flowers_plants_62_eslf', 'general_15_eslf', 'general_19_eslf', 'general_31_eslf', 'general_4_eslf', 'general_9_eslf', 'occlusions_24_eslf';

HCI [1]: *bedroom', 'bicycle', 'boardgames', 'boxes', 'cotton', 'dishes', 'greek', 'herbs', 'kitchen', 'museum', 'origami', 'pens', 'pillows', 'platonic', 'sideboard', 'table', 'tomb', 'tower', 'town', 'vinyl';*

Inria [4]: *Antiques_dense', 'Big_clock_dense', 'Black&white_dense', 'Blue_room_dense', 'Bowl_chair_dense', 'Chess_dense', 'Coffee_beans_vases_dense', 'Coffee_time_dense', 'Dishes_dense', 'Electro_devices_dense', 'Flowers_clock_dense', 'Flying_dice_dense', 'Flying_furniture_dense', 'Flying_toys_dense', 'Furniture_dense', 'Kiwi_bike_dense', 'Lonely_man_dense', 'Microphone_dense', 'Microphone_rooster_dense', 'Origami_dense', 'Pinenuts_blue_dense', 'Pinenuts_white_dense', 'Robots_dense', 'Rooster_clock_dense', 'Roses_bed_dense', 'Roses_table_dense', 'Smiling_crowd_dense', 'Smiling_crowd_roses_dense', 'Three_pillows_dense', 'Toy_bricks_dense', 'Toy_friends_dense', 'Toys_dense', 'Two_vases_dense', 'White_lamp_dense', 'White_roses_dense'.*

1.2 Testing Dataset

The testing dataset contains 30 LF images from Kalantari Lytro [3], 2 LF images from HCI [1] and 4 LF images from Inria [4].

Kalantari Lytro [3]: *'Cars', 'Flower1', 'Flower2', 'IMG_1085_eslf', 'IMG_1086_eslf', 'IMG_1184_eslf', 'IMG_1187_eslf', 'IMG_1306_eslf', 'IMG_1312_eslf', 'IMG_1316_eslf', 'IMG_1317_eslf', 'IMG_1320_eslf', 'IMG_1321_eslf', 'IMG_1324_eslf', 'IMG_1325_eslf', 'IMG_1327_eslf', 'IMG_1328_eslf', 'IMG_1340_eslf', 'IMG_1389_eslf', 'IMG_1390_eslf', 'IMG_1411_eslf', 'IMG_1419_eslf', 'IMG_1528_eslf', 'IMG_1541_eslf', 'IMG_1554_eslf', 'IMG_1555_eslf', 'IMG_1586_eslf', 'IMG_1743_eslf', 'Rock', 'Seahorse';*

HCI [1]: *'dino', 'medieval2';*

Inria [4]: *'Bottles_dense', 'Camera_brush_dense', 'Dinosaur_dense', 'Green_balloon_dense'.*

2 Detailed Quantitative Evaluation Result for Each Testing Data

Table 1. Quantitative (PSNR/SSIM) comparisons of our method against state-of-the-art ones over the *Kalantari et al.* [3] dataset on task: $1 \rightarrow 49$. "-" indicates that the method cannot work on the task.

LF image	Inagaki *et al.* [2]	Kalantari *et al.* [3]	Yeung *et al.* [5]	Ours (Single)	Ours (Multiple)
Cars	27.03/0.890	-	-	28.58/0.923	**36.41/0.983**
Flower1	27.62/0.904	-	-	30.73/0.946	**36.74/0.984**
Flower2	25.99/0.875	-	-	28.87/0.921	**37.41/0.983**
IMG_1085_eslf	35.12/0.952	-	-	38.87/0.972	**43.40/0.987**
IMG_1086_eslf	34.72/0.953	-	-	37.97/0.975	**45.46/0.992**
IMG_1184_eslf	39.91/0.934	-	-	41.95/0.960	**45.95/0.984**
IMG_1187_eslf	36.17/0.902	-	-	38.38/0.937	**45.25/0.985**
IMG_1306_eslf	31.77/0.875	-	-	33.65/0.912	**40.31/0.986**
IMG_1312_eslf	35.62/0.928	-	-	38.70/0.958	**47.44/0.990**
IMG_1316_eslf	32.44/0.896	-	-	35.69/0.942	**43.23/0.989**
IMG_1317_eslf	30.78/0.916	-	-	32.47/0.941	**41.36/0.990**
IMG_1320_eslf	30.38/0.941	-	-	33.31/0.969	**40.12/0.990**
IMG_1321_eslf	36.86/0.938	-	-	39.14/0.960	**45.30/0.988**
IMG_1324_eslf	41.94/0.973	-	-	44.83/0.982	**50.13/0.992**
IMG_1325_eslf	38.87/0.963	-	-	40.79/0.974	**45.68/0.989**
IMG_1327_eslf	35.05/0.933	-	-	36.87/0.963	**41.29/0.986**
IMG_1328_eslf	35.26/0.908	-	-	37.65/0.947	**44.25/0.984**
IMG_1340_eslf	37.59/0.946	-	-	41.17/0.972	**48.78/0.992**
IMG_1389_eslf	33.67/0.937	-	-	35.42/0.953	**47.87/0.993**
IMG_1390_eslf	38.79/0.952	-	-	41.11/0.971	**49.32/0.993**
IMG_1411_eslf	28.09/0.911	-	-	29.85/0.932	**36.63/0.978**
IMG_1419_eslf	28.01/0.914	-	-	30.12/0.945	**37.61/0.982**
IMG_1528_eslf	26.67/0.864	-	-	27.43/0.893	**34.64/0.968**
IMG_1541_eslf	25.81/0.794	-	-	27.65/0.856	**36.09/0.971**
IMG_1554_eslf	21.18/0.798	-	-	24.46/0.874	**30.61/0.965**
IMG_1555_eslf	23.59/0.837	-	-	27.76/0.910	**33.79/0.974**
IMG_1586_eslf	33.95/0.948	-	-	35.45/0.964	**43.80/0.991**
IMG_1743_eslf	33.35/0.943	-	-	33.45/0.949	**38.96/0.972**
Rock	28.24/0.860	-	-	29.87/0.905	**37.97/0.978**
Seahorse	28.74/0.924	-	-	30.55/0.951	**38.17/0.988**
AVG	32.11/0.910	-	-	34.42/0.942	**41.47/0.984**

Table 2. Quantitative (PSNR/SSIM) comparisons of our method against state-of-the-art ones over the *Kalantari et al.* [3] dataset on task: 2 → 49. "-" indicates that the method cannot work on the task.

LF image	Inagaki *et al.* [2]	Kalantari *et al.* [3]	Yeung *et al.* [5]	Ours (Single)	Ours (Multiple)
Cars	34.44/0.970	33.64/0.972	-	35.46/0.980	**37.62/0.986**
Flower1	35.69/0.975	34.64/0.972	-	38.03/0.986	**37.68/0.988**
Flower2	35.14/0.965	33.48/0.965	-	37.00/0.982	**39.04/0.987**
IMG_1085_eslf	41.52/0.971	42.65/0.982	-	42.77/0.987	**44.95/0.989**
IMG_1086_eslf	42.20/0.981	45.64/0.989	-	43.43/0.991	**46.73/0.993**
IMG_1184_eslf	42.15/0.957	43.00/0.969	-	45.78/0.982	**47.16/0.987**
IMG_1187_eslf	42.01/0.967	42.45/0.975	-	45.15/0.984	**46.59/0.989**
IMG_1306_eslf	40.78/0.976	40.00/0.979	-	43.73/0.990	**43.83/0.990**
IMG_1312_eslf	43.83/0.977	44.22/0.984	-	47.60/0.990	**48.55/0.992**
IMG_1316_eslf	41.01/0.979	39.86/0.979	-	43.49/0.989	**44.87/0.992**
IMG_1317_eslf	39.99/0.981	39.16/0.981	-	42.54/0.990	**43.58/0.993**
IMG_1320_eslf	38.46/0.978	37.21/0.983	-	39.02/0.989	**41.47/0.992**
IMG_1321_eslf	44.38/0.982	44.43/0.986	-	**47.68/0.991**	46.87/0.990
IMG_1324_eslf	46.42/0.984	46.17/0.987	-	49.80/0.992	**50.57/0.993**
IMG_1325_eslf	44.01/0.983	42.98/0.984	-	46.10/0.989	**46.99/0.990**
IMG_1327_eslf	38.89/0.965	40.92/0.981	-	41.50/0.987	**42.11/0.989**
IMG_1328_eslf	41.20/0.963	42.26/0.979	-	44.57/0.985	**44.63/0.986**
IMG_1340_eslf	45.71/0.984	45.47/0.987	-	49.28/0.992	**49.59/0.993**
IMG_1389_eslf	45.72/0.990	44.37/0.989	-	47.89/0.993	**48.84/0.994**
IMG_1390_eslf	46.25/0.987	45.92/0.989	-	49.19/0.993	**50.16/0.994**
IMG_1411_eslf	34.81/0.965	31.24/0.955	-	37.18/0.978	**39.00/0.984**
IMG_1419_eslf	37.21/0.976	35.41/0.975	-	37.34/0.982	**39.30/0.985**
IMG_1528_eslf	31.77/0.936	30.59/0.945	-	33.92/0.963	**36.19/0.975**
IMG_1541_eslf	32.81/0.938	32.48/0.952	-	35.25/0.965	**37.38/0.978**
IMG_1554_eslf	30.26/0.956	28.40/0.941	-	32.04/0.972	**32.38/0.977**
IMG_1555_eslf	33.22/0.965	31.60/0.955	-	**35.29**/0.978	34.96/**0.982**
IMG_1586_eslf	40.73/0.982	39.74/0.984	-	43.01/0.990	**44.81/0.992**
IMG_1743_eslf	39.08/0.968	35.82/0.958	-	39.39/0.971	**42.04/0.978**
Rock	34.05/0.948	34.37/0.964	-	37.08/0.974	**38.86/0.982**
Seahorse	36.15/0.977	33.94/0.974	-	36.93/0.985	**39.95/0.991**
AVG	39.33/0.971	38.74/0.974	-	41.58/0.984	**42.89/0.988**

Table 3. Quantitative (PSNR/SSIM) comparisons of our method against state-of-the-art ones over the *Kalantari et al.* [3] dataset on task: 4 → 49. "-" indicates that the method cannot work on the task.

LF image	Inagaki *et al.* [2]	Kalantari *et al.* [3]	Yeung *et al.* [5]	Ours (Single)	Ours (Multiple)
Cars	35.51/0.975	35.91/0.981	35.52/0.962	37.09/0.985	**39.18/0.990**
Flower1	36.85/0.980	37.50/0.984	37.94/0.967	39.14/0.989	**41.20/0.993**
Flower2	36.40/0.971	35.86/0.979	37.14/0.963	38.46/0.986	**40.90/0.991**
IMG_1085_eslf	42.19/0.973	45.29/0.987	44.97/0.966	44.73/0.989	**46.77/0.991**
IMG_1086_eslf	43.97/0.983	47.34/0.991	46.75/0.970	47.24/0.993	**49.45/0.994**
IMG_1184_eslf	42.28/0.960	45.00/0.981	43.68/0.960	46.92/0.986	**48.67/0.992**
IMG_1187_eslf	42.25/0.969	44.71/0.984	43.47/0.963	46.40/0.988	**48.16/0.993**
IMG_1306_eslf	41.61/0.980	42.70/0.988	42.56/0.968	44.96/0.991	**46.34/0.993**
IMG_1312_eslf	44.38/0.979	46.31/0.988	46.19/0.969	48.79/0.992	**49.89/0.994**
IMG_1316_eslf	41.87/0.982	42.75/0.987	42.27/0.967	44.95/0.991	**47.82/0.995**
IMG_1317_eslf	40.84/0.983	42.22/0.988	42.04/0.969	43.92/0.992	**46.69/0.996**
IMG_1320_eslf	39.31/0.981	39.71/0.989	40.56/0.969	40.79/0.991	**42.95/0.994**
IMG_1321_eslf	45.13/0.985	46.48/0.990	46.10/0.970	49.04/0.993	**49.47/0.994**
IMG_1324_eslf	46.27/0.984	48.71/0.990	47.58/0.969	50.82/0.993	**51.28/0.994**
IMG_1325_eslf	44.46/0.985	45.29/0.987	44.86/0.968	47.60/0.991	**48.76/0.992**
IMG_1327_eslf	39.57/0.970	42.86/0.987	42.45/0.967	42.37/0.989	**43.86/0.992**
IMG_1328_eslf	41.93/0.969	44.17/0.984	44.20/0.965	46.14/0.988	**47.08/0.991**
IMG_1340_eslf	45.73/0.985	47.84/0.990	46.63/0.969	49.89/0.993	**50.60/0.994**
IMG_1389_eslf	46.18/0.991	47.06/0.992	46.13/0.971	49.33/0.994	**50.37/0.995**
IMG_1390_eslf	46.25/0.988	47.95/0.992	46.89/0.970	50.22/0.994	**51.22/0.995**
IMG_1411_eslf	35.77/0.971	35.90/0.974	35.96/0.955	38.50/0.983	**41.18/0.990**
IMG_1419_eslf	38.51/0.980	38.04/0.984	38.86/0.964	41.05/0.987	**42.75/0.990**
IMG_1528_eslf	32.91/0.948	33.98/0.967	34.64/0.953	34.96/0.969	**38.12/0.984**
IMG_1541_eslf	33.68/0.948	36.04/0.974	36.19/0.956	36.24/0.971	**39.27/0.986**
IMG_1554_eslf	31.88/0.966	30.70/0.965	31.49/0.953	33.69/0.979	**36.17/0.988**
IMG_1555_eslf	34.63/0.972	34.39/0.974	35.01/0.960	36.67/0.984	**38.85/0.990**
IMG_1586_eslf	42.21/0.985	43.44/0.990	43.60/0.970	44.72/0.992	**46.37/0.994**
IMG_1743_eslf	40.48/0.972	36.53/0.963	39.22/0.950	41.78/0.976	**44.22/0.983**
Rock	34.89/0.956	38.66/0.981	38.74/0.962	37.89/0.978	**40.56/0.988**
Seahorse	37.18/0.980	35.98/0.983	37.15/0.966	38.83/0.989	**42.01/0.993**
AVG	40.17/0.975	41.31/0.983	41.29/0.964	43.10/0.987	**45.01/0.992**

Table 4. Quantitative (PSNR/SSIM) comparisons of our method over the HCI [1] dataset and Inria [4] dataset on the task: 2 → 25.

LF image	Inagaki *et al.* [2]	Ours (Single)	Ours (Multiple)
Bottles_dense	34.23/0.936	39.62/0.971	**40.20/0.971**
Camera_brush_dense	35.16/0.931	36.01/0.971	**40.96/0.978**
Dinosaur_dense	30.07/0.896	**32.12/0.922**	32.09/0.922
Green_balloon_dense	36.36/0.971	36.93/0.982	**42.39/0.985**
dino	38.66/0.963	**47.40/0.991**	45.67/0.986
medieval2	34.98/0.905	38.70/0.943	**38.89/0.948**
AVG	34.91/0.934	38.46/0.963	**40.03/0.965**

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