Supplementary Materials

Are recent SISR techniques suitable for industrial applications at low magnification?

I Subjective Testing

A. Testing Images and Environments

In this paper, 21 images are randomly selected from DIV2K set [21], which consists of high-quality 2K images. These selected images are illustrated in Fig.S-1. For subjective testing, 20 subjects are invited to score different upsampled images on a SAMSUNG 72-inch UHD TV and a PC with NVIDIA TITAN X GPUs. As illustrated in Fig.S-2, the observers stand less than 1m from the screen and they can stand closer to observe the local details.

B. Implemetantional Details

For directly rating, the observers score the upsampled images from 0.0 at the bottom to 5.0 at the top by comparing them with the HR ground truth. The mean opinion scores (MOS) are listed in the Table S-1. For pairwise comparison, viewers need to compare each pair of upsampled images, and the better results are marked with 1. For example, if there are N_m methods, total $(N_m - 1)!$ times of comparisons are implemented. Fig.S-3 shows an example of the preference table for one image. After all the methods are compared, the summation in one row denotes the score of corresponding method. The scores of various methods given by observer are averaged on all the test images, and the final scores are the mean value of all the viewers. Note that the names of the methods are also hidden.

Fig.S-1. Selected 2K test images in the experiment.

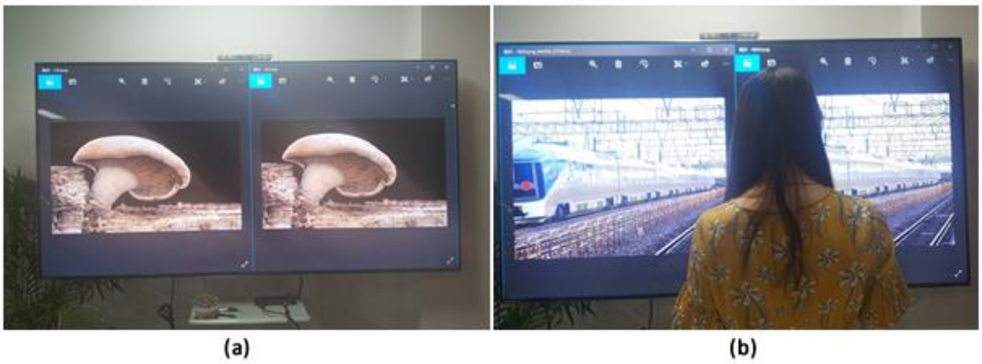

Fig.S-2. The setup of experiments, (a) a pair of test images are simultaneously illustrated on an UHD TV, (b) an observer is scoring the images.

IMG3	A	B	C	D	E	F	G		Score
A		0	0	0	0	0	0		0
B	1		0	0	0	0	0		1
C	1	1		1	0	1	0		4
D	1	1	0		0	1	1		4
E	1	1	1	1		0	0		4
F	1	1	0	0	1		1		4
G	1	1	1	0	1	0			4

Fig.S-3. An example of preference table for a subject and an image in the pairwise comparison. (A-G denote different methods)

Table S-1. The average scores for direct rating (0-5).

	Bicubic	ANR	LPE	SRCNN	VDSR	ResNet	FAST
MOS	4.25	4.47	<u>4.94</u>	4.90	4.93	**4.95**	4.92

Table S-2. The KCC values of different viewers.

Viewer	**#1**	**#2**	**#3**	**#4**	**#5**	**#6**	**#7**	**#8**	**#9**	**#10**
KCCs	0.714	0.357	<u>0.857</u>	0.500	0.571	0.785	0.714	0.785	0.643	0.785
Viewer	**#11**	**#12**	**#13**	**#14**	**#15**	**#16**	**#17**	**#18**	**#19**	**#20**
KCCs	**0.928**	0.785	0.643	<u>0.857</u>	0.714	0.571	0.785	<u>0.857</u>	0.785	0.714

Table S-3. The average scores for pairwise comparison.

	Bicubic	ANR	LPE	SRCNN	VDSR	ResNet	FAST
MOS	0.05	0.67	<u>2.87</u>	2.79	2.84	**2.90**	2.85

As mentioned in the manuscript, the unreasonable circular triad cases are often occurred in the experiment, because the results of DNN-based methods are difficult to be distinguished. Hence, the KCC values are calculated to evaluate the consistency of the scores. The KCC values of the viewers are shown in Table S-2. Note that the ideal KCC value with no failure case should be 1. From Table S-2, it can be found that no viewer achieves ideal KCC and most of them have low KCC values. That means many observers cannot perceive the difference of these state-of-the-arts. By weighting the average scores with corresponding KCC values, the final paired comparison scores are list in Table S-3. The DNN-based methods, LPE, and the proposed FAST obtain similar results. Note that LPE achieves higher scores than SRCNN and VDSR in both two testing, but indeed we cannot find the results of LPE are visually better than that of SRCNN and VDSR.

II More Subjective Results

Limited by the length of the manuscript, only three figures are illustrated. In the following, more upsampled results are shown for subjective comparisons. Fig.S-4 shows more upsampled results of bicubic, ANR, and recent DNN-based methods. It still can be found that the DNN-based methods outperform bicubic and ANR, but the results of these DNN-based methods are quite similar.

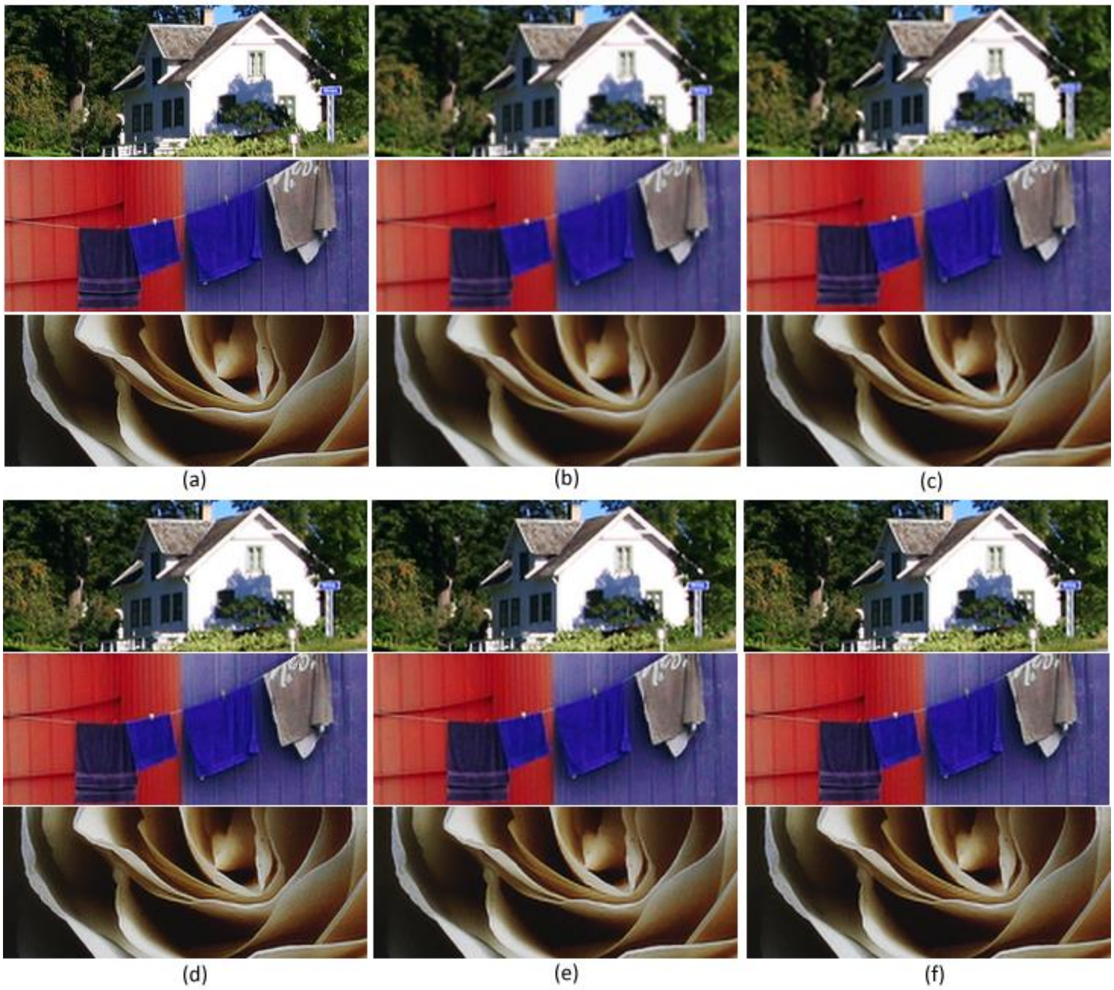

Fig.S-4. The upscaled results of different methods, (a) original HR ground truth, (b) bicubic, (c) ANR [13], (d) SRCNN [17], (e) VDSR [18], (f) ResNet.

Fig. S-5 and Fig. S-6 illustrate more image details magnified with these methods. The proposed method still obtain comparable results with these state-of-the-art methods for $1.5\times$ magnification. Note that ResNet can obtain higher PSNR values than other methods, but the visual quality of its results have not been significantly improved. Hence, we compare all the test images and find some details that ResNet clearly outperforms other methods. As illustrated in Fig. S-7, the blurring and thin lines are magnified with different methods. The LPE, FAST and DNN-based methods can recover clear and sharp edges, and ResNet over-sharpens the edges and thus obtains the sharpest lines. But note that these types of tiny lines are not very significant among the whole image, and no viewer has observed these subtle differences before being pointed out.

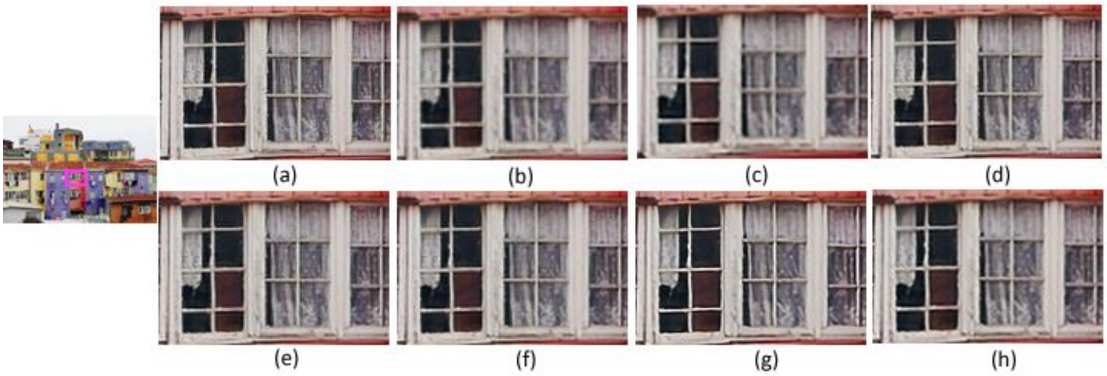

Fig.S-5. The 1.5 × upsampled results with different methods. (a) the HR images, (b) bicubic, (c) ANR [13], (d) LPE [16], (e) SRCNN [17], (f) VDSR [18], (g) ResNet, (h) the proposed FAST.

Fig.S-6. The 1.5 × upsampled results with different methods. (a) the HR images, (b) bicubic, (c) ANR [13], (d) LPE [16], (e) SRCNN [17], (f) VDSR [18], (g) ResNet, (h) the proposed FAST.

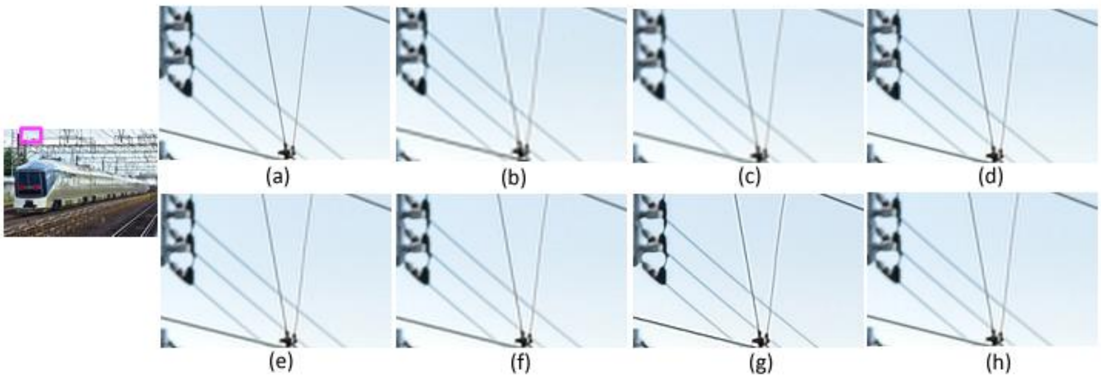

Fig.S-7. The 1.5 × upsampled results of thin lines with different methods. (a) the HR images, (b) bicubic, (c) ANR [13], (d) LPE [16], (e) SRCNN [17], (f) VDSR [18], (g) ResNet, (h) the proposed FAST.