Image Retargeting by Content-Aware Synthesis: Supplemental Materials

Weiming Dong *Member, IEEE,* Fuzhang Wu, Yan Kong, Xing Mei *Member, IEEE,* Tong-Yee Lee *Senior Member, IEEE,* and Xiaopeng Zhang, *Member, IEEE*

1 Evaluation of Texture Detection

In order to demonstrate the efficiency of our automatic texture detection algorithm, we manually masked the textural regions of the images in our dateset TSRD as the ground truth. Furthermore, we implemented the method of [1] and compared it with ours. However, the method in [1] does not clearly indicate how to judge whether a pixel belongs to a textural region or not according to the feature values of LU transform. Since the recall rate is more important in our image retargeting application, we choose a threshold which minimizes the difference of the recall rate and compare the precision between the two methods. It has been proved that our method has more advantages in terms of precision. As calculated in our experiments, the precision and recall rate of our method is 86.52% and 91.67%, the ones of [1] are 76.48% and 86.35%.

2 More Image Resizing Results 1

In Figs. 1 and 2, we show two retargeting examples by using inverse texture synthesis [2], apparently this method is not fit for image retargeting operation. From Fig. 3 to Fig. 88, we show all the stimuli and statistics of our user study as well as the results of texture detection and saliency detection. The original images of Figs. 57-88 are picked from the RetargetMe benchmark [3]. From Fig. 89 to Fig. 91, we show examples of image enlargement by using our synthesis operator to generate the textural regions in the result. Note that for image enlargement, we also use F-MultiOp for initialization and then re-synthesis the T-regions.

3 More Image Resizing Results 2

From Fig. 92 to Fig. 138, we show some retargeting results generated by our method and the other six state-of-the-art image retargeting methods. The original images are all selected from the RetagetMe benchmark [3]. Since these original images do not contain any textures or prominent textural regions (e.g., the T-regions are small or there is no obvious textural elements in the T-regions), for most of them our method degenerate to the fast multi-operators method [4] during the retargeting process. We can see that the quality of our results is comparable with the state-of-the-art image retargeting methods. However, it is difficult to use these examples to show the advantages of our method due to the lack of prominent textural regions.

- *Weiming Dong, Fuzhang Wu, Yan Kong, Xing Mei and Xiaopeng Zhang are with NLPR-LIAMA, Institute of Automation, Chinese Academy of Sciences, Beijing, China. E-mail: {Weiming.Dong, Xiaopeng.Zhang}@ia.ac.cn.*
- *Tong-Yee Lee is with National Cheng-Kung University, Taiwan. E-mail: tonylee@mail.ncku.edu.tw.*

(a) Original Image (b) ITS [2]

Fig. 1. Retargeting by inverse texture synthesis method.

(a) Original Image (b) ITS [2]

Fig. 2. Retargeting by inverse texture synthesis method.

4 More Saliency Detection Results

In Figs. 139, 140, and 141, we show three more saliency detection results of texture images. We can see that our algorithm can better mark the visually important areas of a texture image, especially the non-object areas.

5 Definition of Windowed Total Measures

In our automatic texture detection algorithm, we use a general pixel-wise *windowed total variation* measure [5], which is written as:

$$\mathscr{D}_x(p) = \sum_{q \in R(p)} g_{p,q} \cdot |(\partial_x S)_q|,$$
$$\mathscr{D}_y(p) = \sum_{q \in R(p)} g_{p,q} \cdot |(\partial_y S)_q|, \quad (1)$$

where q belongs to $R(p)$, the rectangular region centered at pixel p. $\mathscr{D}_x(p)$ and $\mathscr{D}_y(p)$ are *windowed total variations* in the x and y directions for pixel p, which count the absolute spatial difference within the window $R(p)$. $g_{p,q}$ is a weighting function defined according to spatial affinity, expressed as

$$g_{p,g} \propto \exp\left(-\frac{(x_p - x_q)^2 + (y_p - y_q)^2}{2\sigma^2}\right), \quad (2)$$

where σ controls the spatial scale of the window. In an image with salient textures, both the detail and structure pixels yield large $\mathscr{D}$, which indicates that the *windowed total variation* is responsive to visual saliency.

To help distinguish prominent structures from the texture elements, besides $\mathscr{D}$, the *windowed inherent variation* is also used

$$\mathscr{L}_x(p) = |\sum_{q \in R(p)} g_{p,q} \cdot (\partial_x S)_q|,$$
$$\mathscr{L}_y(p) = |\sum_{q \in R(p)} g_{p,q} \cdot (\partial_y S)_q|. \quad (3)$$

$\mathscr{L}$ captures the overall spatial variation. Different from the expression in Eq. (1), it does not incorporate the modulus. So the sum of ∂S depends on whether the gradients in a window are coincident or not, in terms of their directions, because ∂S for one pixel could be either positive or negative.

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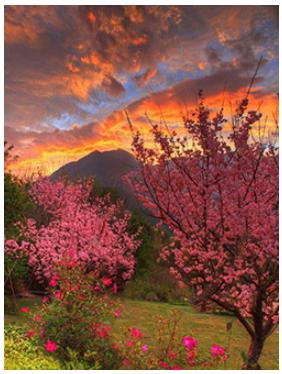
(a) Original Image



(b) Ours

(c) AAD [6]

(d) BDS [7]

(e) Cropping

(f) F-MultiOp [4]

(g) PBW [8]

(h) Shift-Map [9]

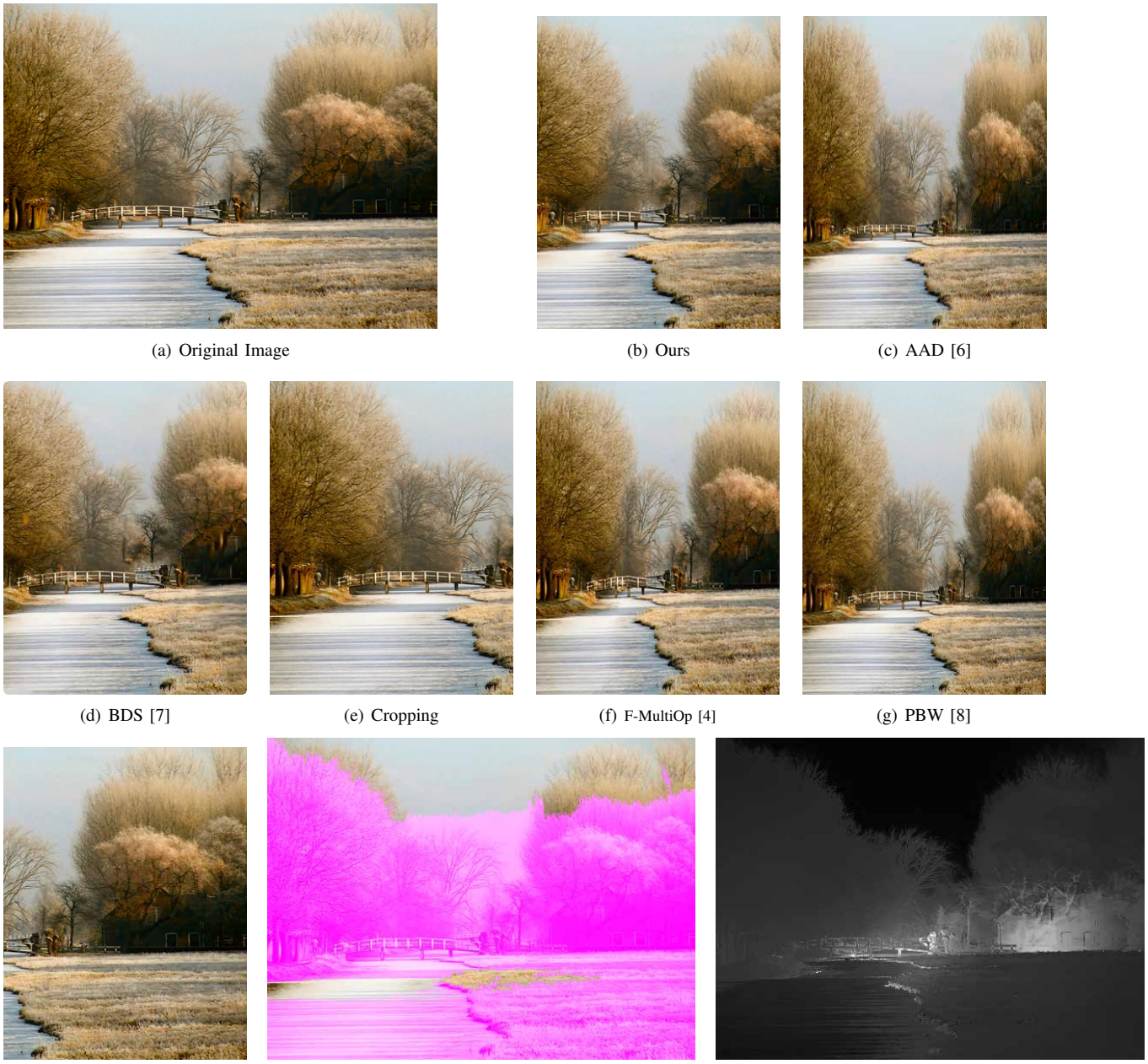
(i) Texture Mask

(j) Saliency Map

Fig. 3. Input resolution is 500×333, output resolution is 250×333.

TABLE 1
User study. We show the percentages when our method and the competitors have been chosen by the participants.

	Ours	AAD	BDS	Cropping	F-MultiOp	PBW	Shift-Map
Figure 3	**78.18%**	7.27%	9.09%	12.73%	30.91%	5.45%	0.00%



(a) Original Image (b) Ours (c) AAD [6]

(d) BDS [7] (e) Cropping (f) F-MultiOp [4] (g) PBW [8]

(h) Shift-Map [9] (i) Texture Mask (j) Saliency Map

Fig. 4. Input resolution is 500×375, output resolution is 280×360.

TABLE 2
User study. We show the percentages when our method and the competitors have been chosen by the participants.

	Ours	AAD	BDS	Cropping	F-MultiOp	PBW	Shift-Map
Figure 4	**45.45%**	12.73%	25.45%	29.09%	21.82%	20.00%	1.82%

(a) Original Image (b) Ours (c) AAD [6]

(d) BDS [7] (e) Cropping (f) F-MultiOp [4] (g) PBW [8]

(h) Shift-Map [9] (i) Texture Mask (j) Saliency Map

Fig. 5. Input resolution is 456×340, output resolution is 264×340.

TABLE 3
User study. We show the percentages when our method and the competitors have been chosen by the participants.

	Ours	AAD	BDS	Cropping	F-MultiOp	PBW	Shift-Map
Figure 5	**29.09%**	5.45%	5.45%	23.64%	10.91%	7.27%	61.82%

(a) Original Image

(b) Ours

(c) AAD [6]

(d) BDS [7]

(e) Cropping

(f) F-MultiOp [4]

(g) PBW [8]

(h) Shift-Map [9]

(i) Texture Mask

(j) Saliency Map

Fig. 6. Input resolution is 500×332, output resolution is 250×332.

TABLE 4
User study. We show the percentages when our method and the competitors have been chosen by the participants.

	Ours	AAD	BDS	Cropping	F-MultiOp	PBW	Shift-Map
Figure 6	**40.00%**	9.09%	14.55%	61.82%	3.64%	12.73%	14.55%

(a) Original Image

(b) Ours

(c) AAD [6]

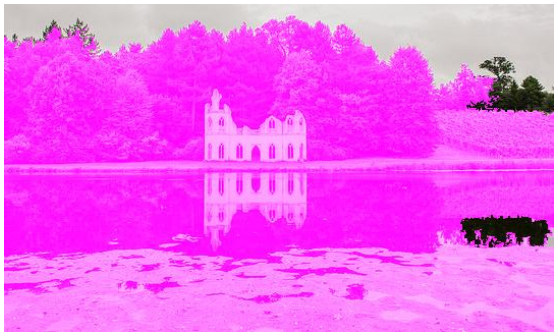
(d) BDS [7]

(e) Cropping

(f) F-MultiOp [4]

(g) PBW [8]

(h) Shift-Map [9]



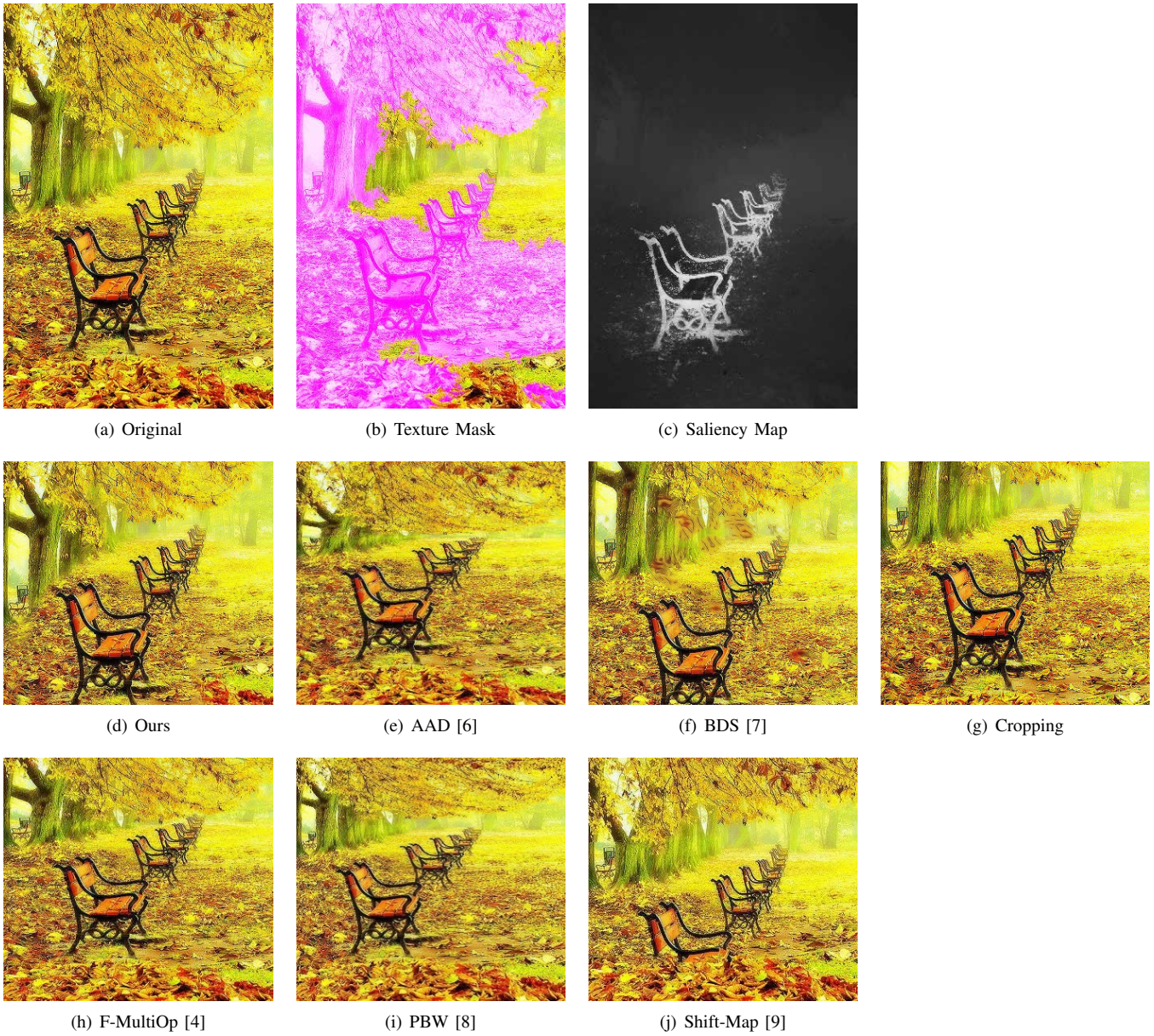
(i) Texture Mask

(j) Saliency Map

Fig. 7. Input resolution is 540×322, output resolution is 270×332.

TABLE 5
User study. We show the percentages when our method and the competitors have been chosen by the participants.

	Ours	AAD	BDS	Cropping	F-MultiOp	PBW	Shift-Map
Figure 7	**54.55%**	3.64%	23.64%	34.55%	3.64%	7.27%	25.45%



(a) Original (b) Texture Mask (c) Saliency Map

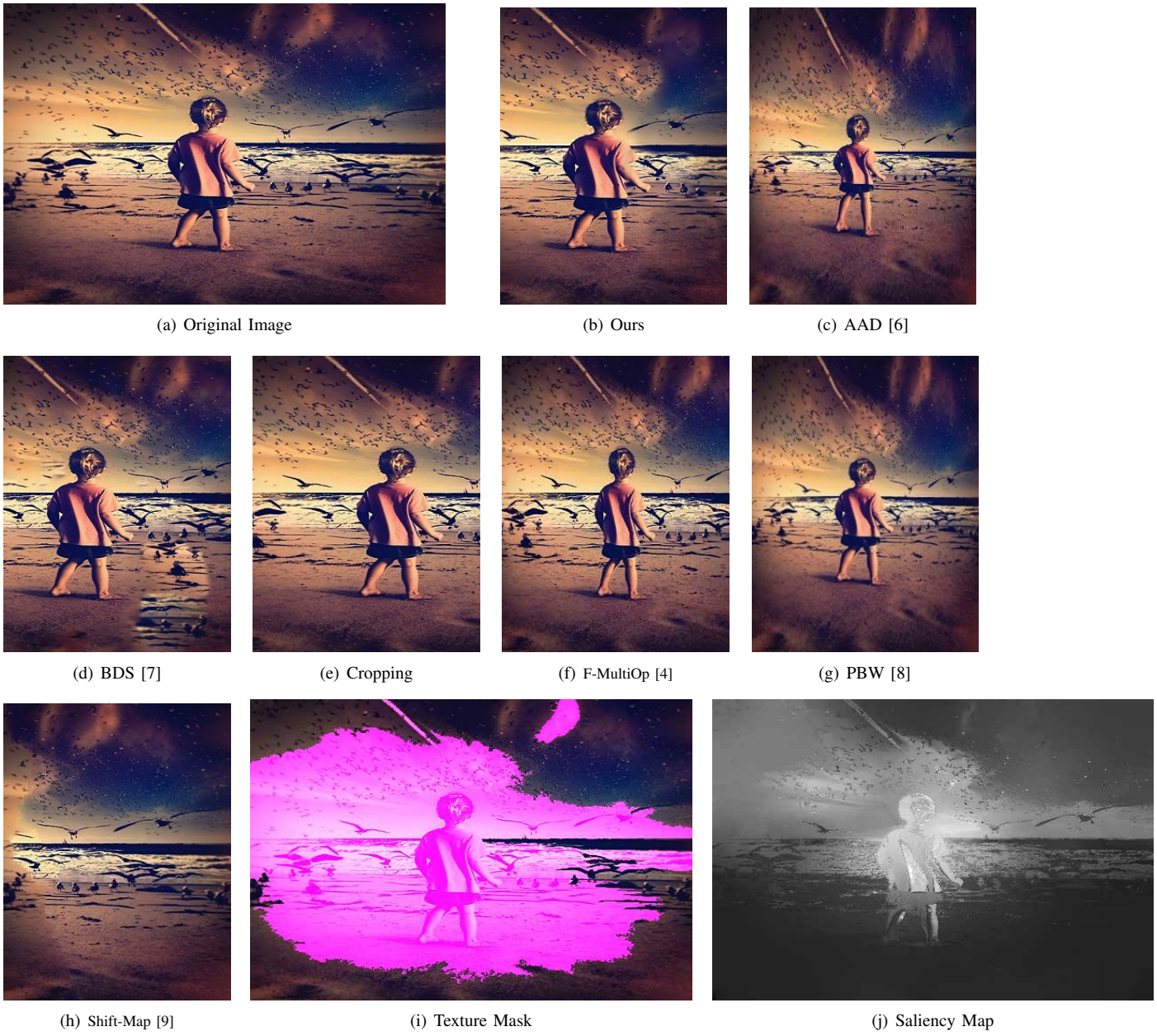
(d) Ours (e) AAD [6] (f) BDS [7] (g) Cropping

(h) F-MultiOp [4] (i) PBW [8] (j) Shift-Map [9]

Fig. 8. Input resolution is 332×500, output resolution is 332×260.

TABLE 6
User study. We show the percentages when our method and the competitors have been chosen by the participants.

	Ours	AAD	BDS	Cropping	F-MultiOp	PBW	Shift-Map
Figure 8	**52.73**%	5.45%	12.73%	36.36%	27.27%	16.36%	0.00%



(a) Original Image (b) Ours (c) AAD [6]

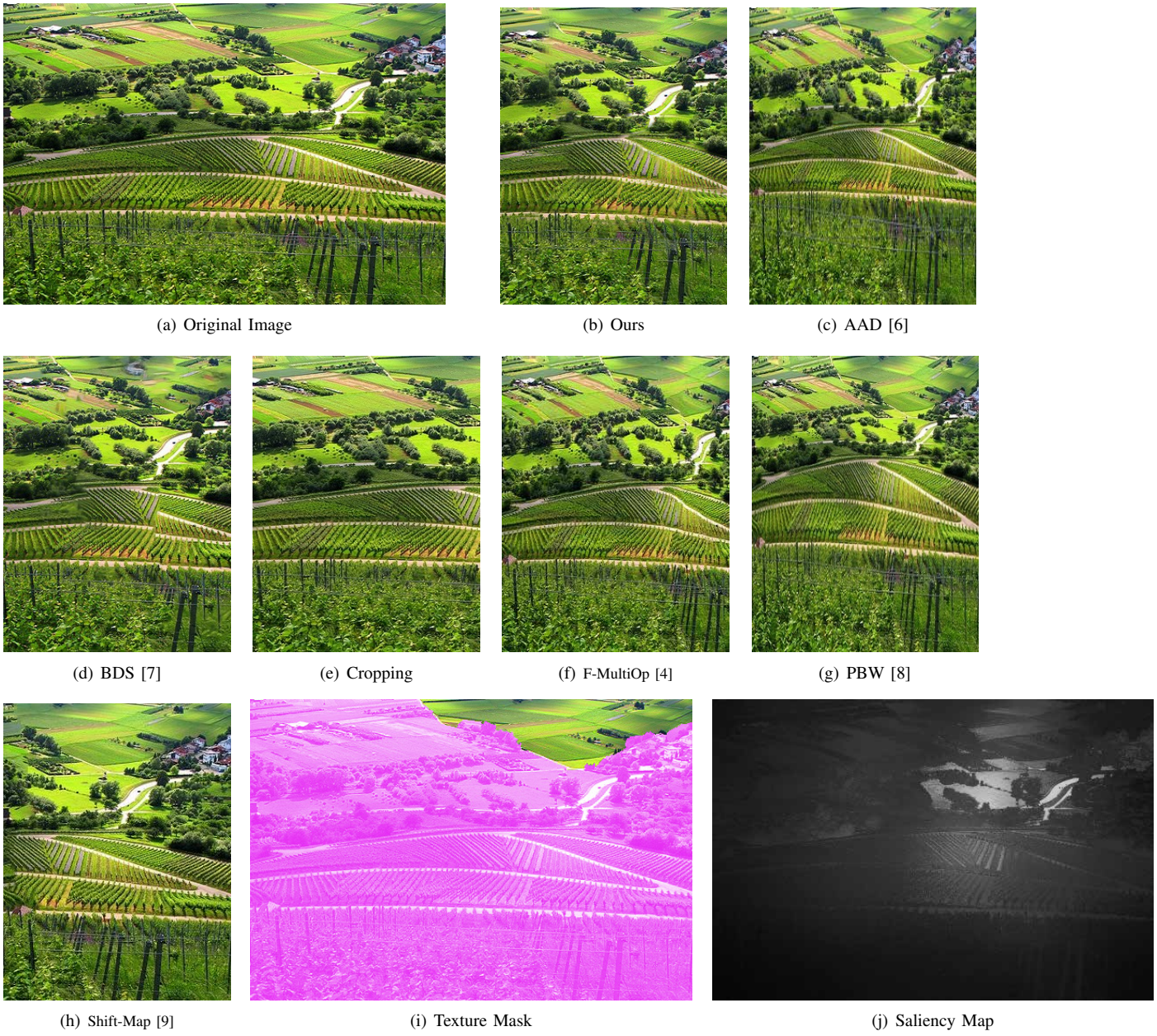
(d) BDS [7] (e) Cropping (f) F-MultiOp [4] (g) PBW [8]

(h) Shift-Map [9] (i) Texture Mask (j) Saliency Map

Fig. 9. Input resolution is 500×340, output resolution is 260×340.

TABLE 7
User study. We show the percentages when our method and the competitors have been chosen by the participants.

	Ours	AAD	BDS	Cropping	F-MultiOp	PBW	Shift-Map
Figure 9	**43.64%**	16.36%	14.55%	23.64%	25.45%	27.27%	0.00%



(a) Original Image (b) Ours (c) AAD [6]

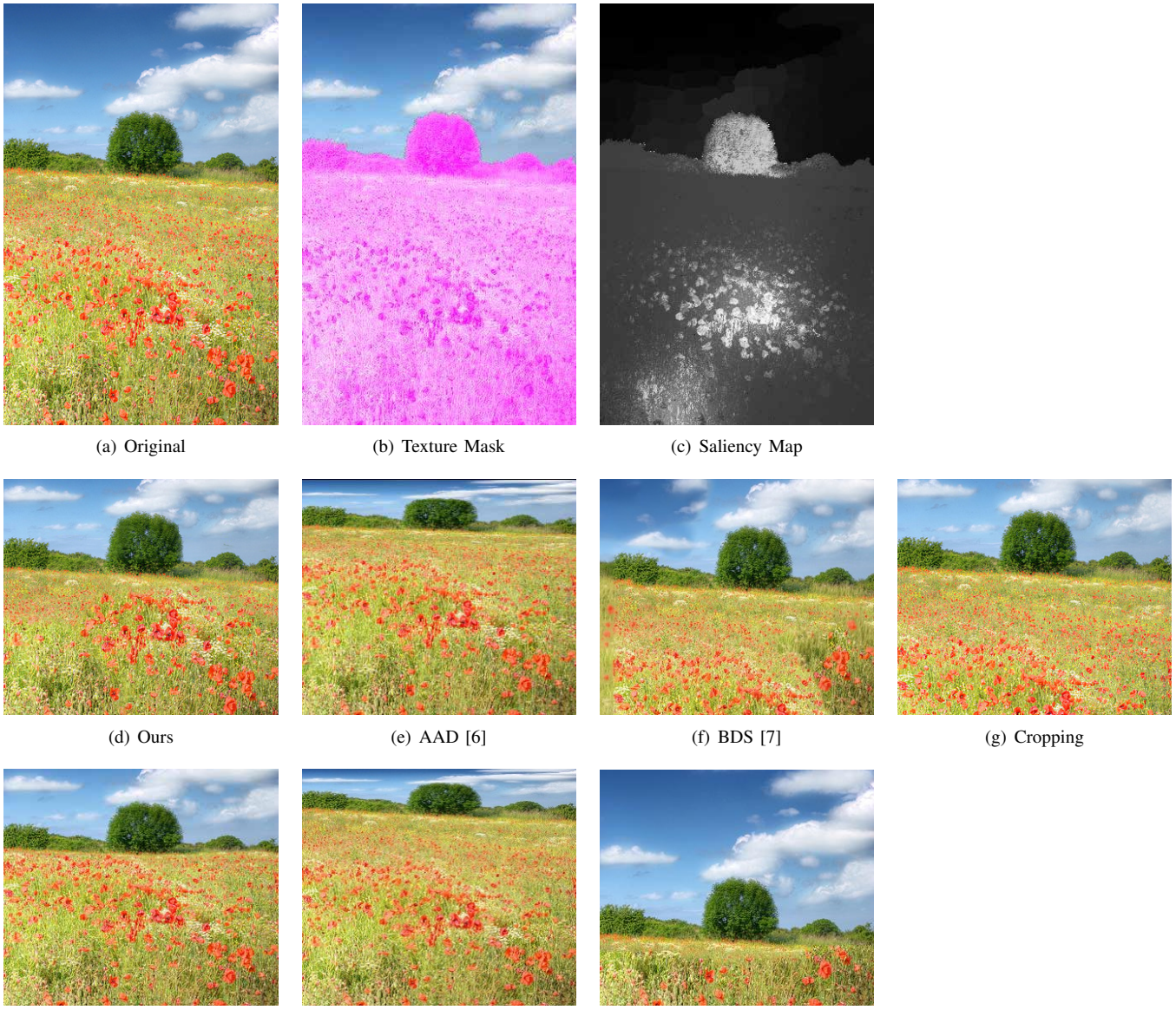
(d) BDS [7] (e) Cropping (f) F-MultiOp [4] (g) PBW [8]

(h) Shift-Map [9] (i) Texture Mask (j) Saliency Map

Fig. 10. Input resolution is 500×340, output resolution is 260×340.

TABLE 8
User study. We show the percentages when our method and the competitors have been chosen by the participants.

	Ours	AAD	BDS	Cropping	F-MultiOp	PBW	Shift-Map
Figure 10	**32.73**%	12.73%	27.27%	14.55%	30.91%	10.91%	10.91%



(a) Original (b) Texture Mask (c) Saliency Map

(d) Ours (e) AAD [6] (f) BDS [7] (g) Cropping

(h) F-MultiOp [4] (i) PBW [8] (j) Shift-Map [9]

Fig. 11. Input resolution is 325×500, output resolution is 325×280.

TABLE 9
User study. We show the percentages when our method and the competitors have been chosen by the participants.

	Ours	AAD	BDS	Cropping	F-MultiOp	PBW	Shift-Map
Figure 11	**61.82%**	0.00%	27.27%	40.00%	14.55%	0.00%	0.00%

(a) Original Image (b) Ours (c) AAD [6]

(d) BDS [7] (e) Cropping (f) F-MultiOp [4] (g) PBW [8]

(h) Shift-Map [9] (i) Texture Mask (j) Saliency Map

Fig. 12. Input resolution is 500×358, output resolution is 280×358.

TABLE 10
User study. We show the percentages when our method and the competitors have been chosen by the participants.

	Ours	AAD	BDS	Cropping	F-MultiOp	PBW	Shift-Map
Figure 12	**43.64**%	10.91%	9.09%	7.27%	27.27%	14.55%	25.45%

(a) Original Image

(b) Ours

(c) AAD [6]

(d) BDS [7]

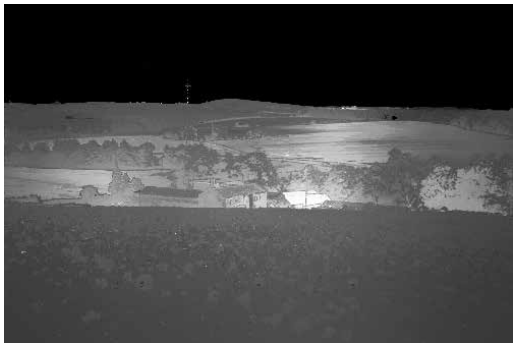
(e) Cropping

(f) F-MultiOp [4]

(g) PBW [8]

(h) Shift-Map [9]

(i) Texture Mask

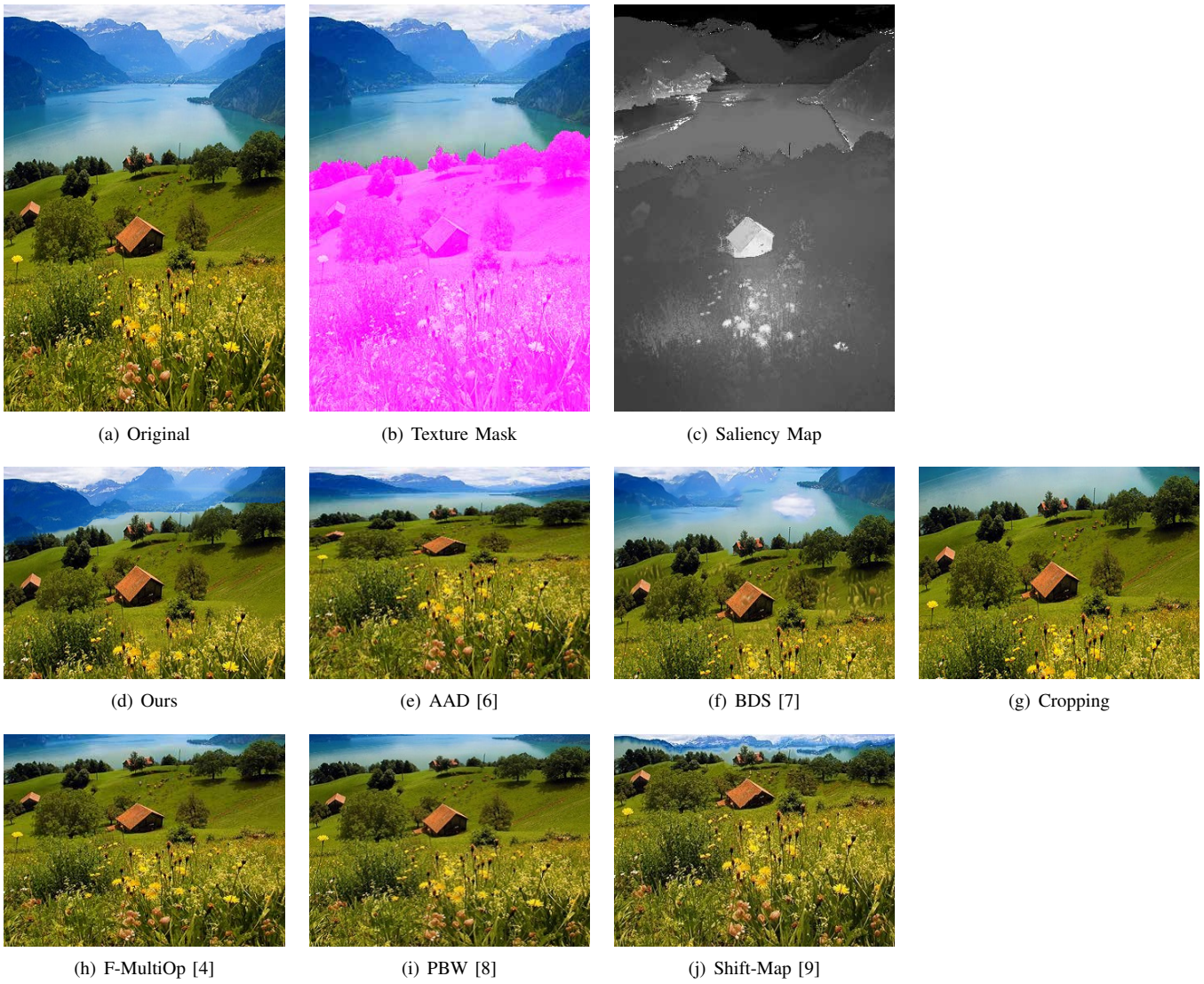


(j) Saliency Map

Fig. 13. Input resolution is 500×333, output resolution is 280×332.

TABLE 11
User study. We show the percentages when our method and the competitors have been chosen by the participants.

	Ours	AAD	BDS	Cropping	F-MultiOp	PBW	Shift-Map
Figure 13	**36.36**%	7.27%	9.09%	30.91%	18.18%	10.91%	27.27%



(a) Original (b) Texture Mask (c) Saliency Map

(d) Ours (e) AAD [6] (f) BDS [7] (g) Cropping

(h) F-MultiOp [4] (i) PBW [8] (j) Shift-Map [9]

Fig. 14. Input resolution is 345×500, output resolution is 345×260.

TABLE 12
User study. We show the percentages when our method and the competitors have been chosen by the participants.

	Ours	AAD	BDS	Cropping	F-MultiOp	PBW	Shift-Map
Figure 14	**70.91**%	5.45%	20.00%	5.45%	1.82%	1.82%	7.27%

(a) Original Image (b) Texture Mask (c) Saliency Map

(d) Ours (e) AAD [6] (f) BDS [7]

(g) Cropping (h) F-MultiOp [4] (i) PBW [8]

(j) Shift-Map [9]

Fig. 15. Input resolution is 400×400, output resolution is 300×200.

TABLE 13
User study. We show the percentages when our method and the competitors have been chosen by the participants.

	Ours	AAD	BDS	Cropping	F-MultiOp	PBW	Shift-Map
Figure 15	**60.00%**	20.00%	27.27%	9.09%	5.45%	10.91%	12.73%

(a) Original Image (b) Texture Mask (c) Saliency Map

(d) Ours (e) AAD [6] (f) BDS [7]

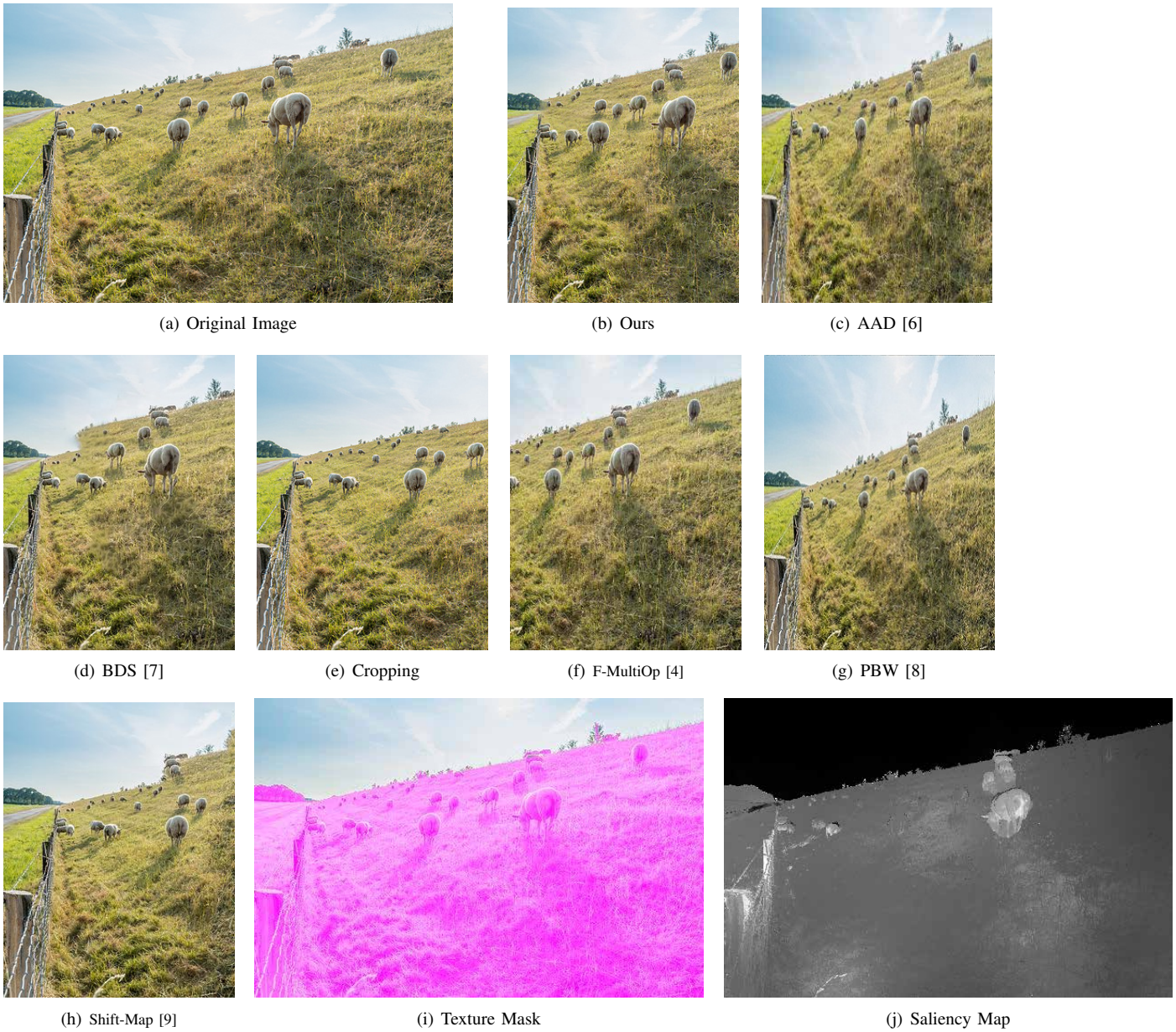
(g) Cropping (h) F-MultiOp [4] (i) PBW [8]

(j) Shift-Map [9]

Fig. 16. Input resolution is 400×400, output resolution is 300×260.

TABLE 14
User study. We show the percentages when our method and the competitors have been chosen by the participants.

	Ours	AAD	BDS	Cropping	F-MultiOp	PBW	Shift-Map
Figure 16	**47.27%**	21.82%	23.64%	27.27%	3.64%	18.18%	3.64%



(a) Original Image (b) Ours (c) AAD [6]

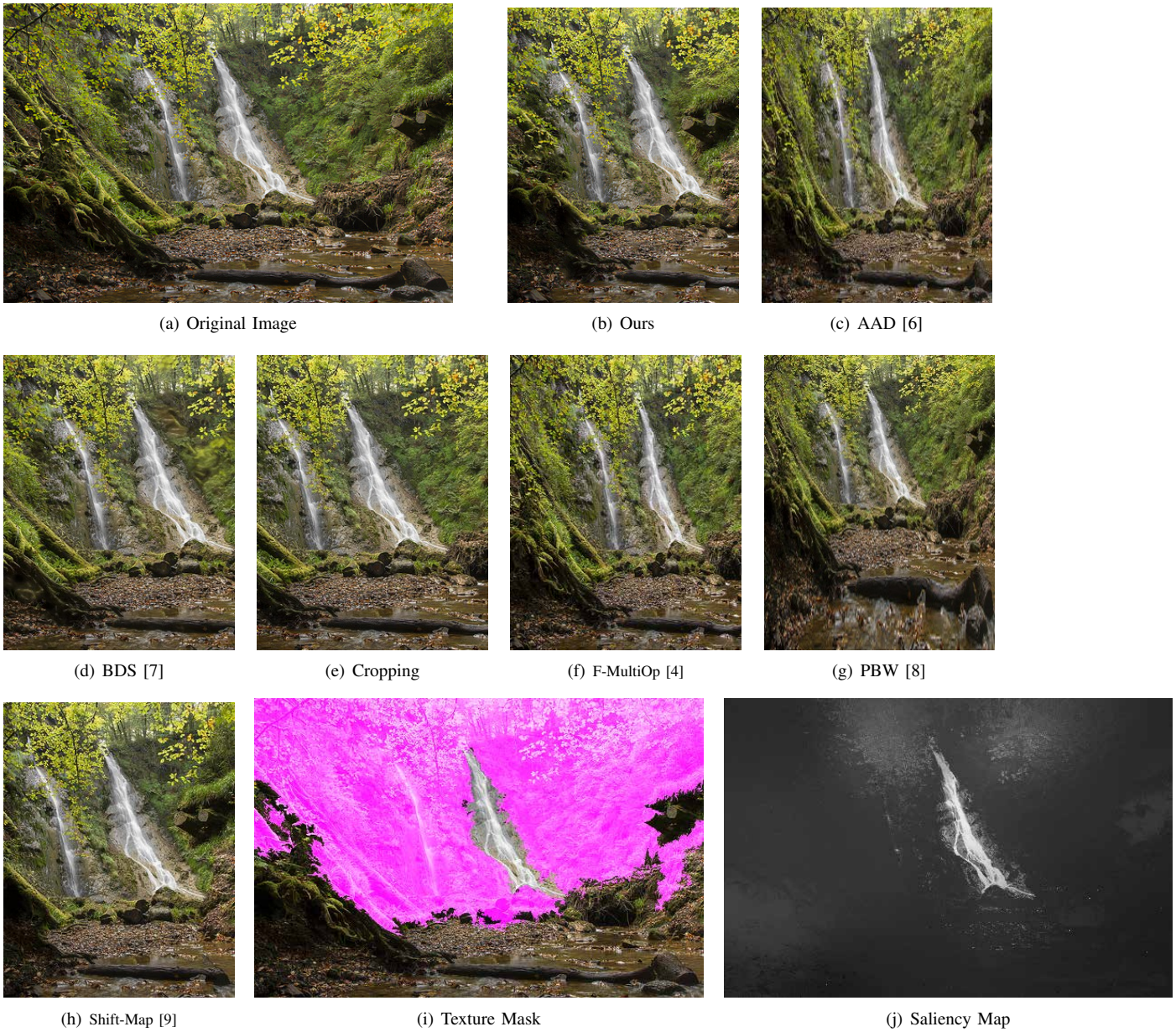
(d) BDS [7] (e) Cropping (f) F-MultiOp [4] (g) PBW [8]

(h) Shift-Map [9] (i) Texture Mask (j) Saliency Map

Fig. 17. Input resolution is 500×333, output resolution is 260×210.

TABLE 15
User study. We show the percentages when our method and the competitors have been chosen by the participants.

	Ours	AAD	BDS	Cropping	F-MultiOp	PBW	Shift-Map
Figure 17	**52.73**%	16.36%	32.73%	12.73%	3.64%	18.18%	5.45%



(a) Original Image (b) Ours (c) AAD [6]

(d) BDS [7] (e) Cropping (f) F-MultiOp [4] (g) PBW [8]

(h) Shift-Map [9] (i) Texture Mask (j) Saliency Map

Fig. 18. Input resolution is 500×333, output resolution is 260×333.

TABLE 16
User study. We show the percentages when our method and the competitors have been chosen by the participants.

	Ours	AAD	BDS	Cropping	F-MultiOp	PBW	Shift-Map
Figure 18	**49.09%**	3.64%	21.82%	20.00%	10.91%	5.45%	24.45%

(a) Original (b) Texture Mask (c) Saliency Map

(d) Ours (e) AAD [6] (f) BDS [7]

(g) Cropping (h) F-MultiOp [4] (i) PBW [8]

(j) Shift-Map [9]

Fig. 19. Input resolution is 340×500, output resolution is 340×250.

TABLE 17
User study. We show the percentages when our method and the competitors have been chosen by the participants.

	Ours	AAD	BDS	Cropping	F-MultiOp	PBW	Shift-Map
Figure 19	**32.73**%	21.82%	29.09%	10.91%	12.73%	16.36%	25.45%

(a) Original Image (b) Ours (c) AAD [6]

(d) BDS [7] (e) Cropping (f) F-MultiOp [4] (g) PBW [8]

(h) Shift-Map [9] (i) Texture Mask (j) Saliency Map

Fig. 20. Input resolution is 500×327, output resolution is 260×327.

TABLE 18
User study. We show the percentages when our method and the competitors have been chosen by the participants.

	Ours	AAD	BDS	Cropping	F-MultiOp	PBW	Shift-Map
Figure 20	**52.73**%	21.82%	10.91%	14.55%	14.55%	14.55%	7.27%

(a) Original (b) Texture Mask (c) Saliency Map

(d) Ours (e) AAD [6] (f) BDS [7]

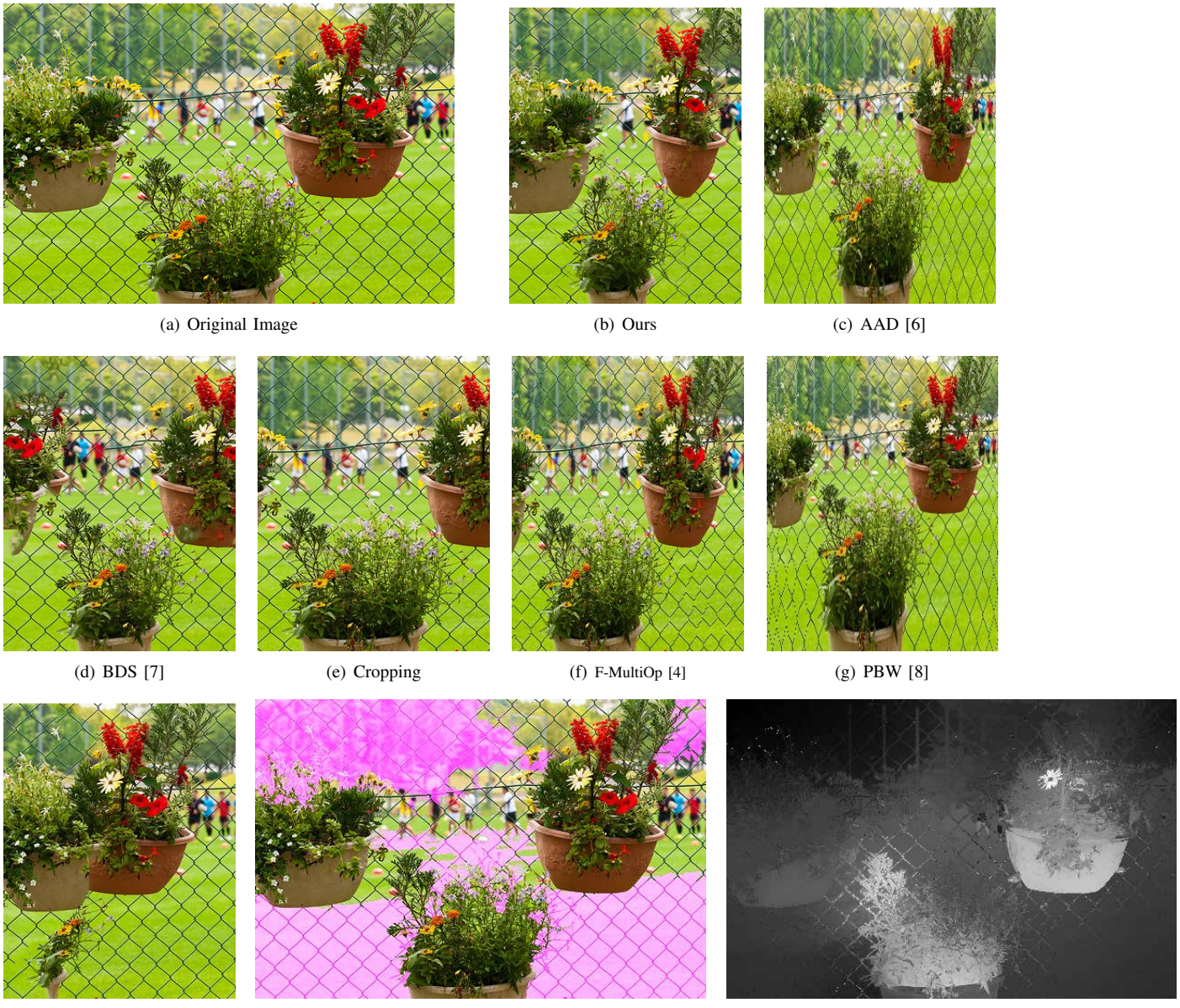
(g) Cropping (h) F-MultiOp [4] (i) PBW [8]

(j) Shift-Map [9]

Fig. 21. Input resolution is 333×500, output resolution is 333×260.

TABLE 19
User study. We show the percentages when our method and the competitors have been chosen by the participants.

	Ours	AAD	BDS	Cropping	F-MultiOp	PBW	Shift-Map
Figure 21	**61.82%**	0.00%	3.64%	56.36%	0.00%	21.82%	0.00%



(a) Original Image (b) Ours (c) AAD [6]

(d) BDS [7] (e) Cropping (f) F-MultiOp [4] (g) PBW [8]

(h) Shift-Map [9] (i) Texture Mask (j) Saliency Map

Fig. 22. Input resolution is 500×332, output resolution is 260×332.

TABLE 20
User study. We show the percentages when our method and the competitors have been chosen by the participants.

	Ours	AAD	BDS	Cropping	F-MultiOp	PBW	Shift-Map
Figure 22	**21.82%**	18.18%	20.00%	21.82%	27.27%	18.18%	0.00%

(a) Original Image

(b) Ours

(c) AAD [6]

(d) BDS [7]

(e) Cropping

(f) F-MultiOp [4]

(g) PBW [8]

(h) Shift-Map [9]

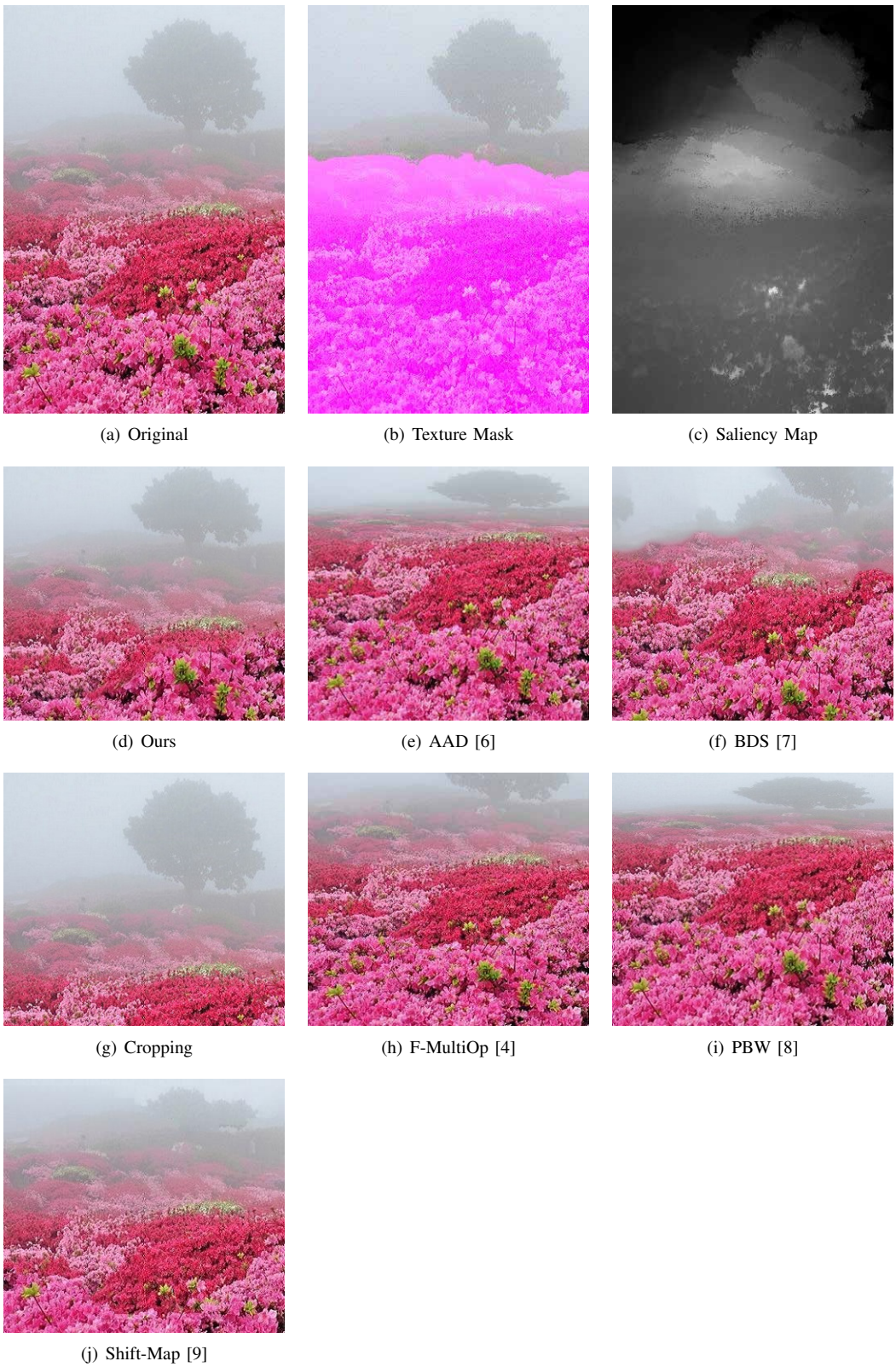
(i) Texture Mask

(j) Saliency Map

Fig. 23. Input resolution is 500×334, output resolution is 250×334.

TABLE 21
User study. We show the percentages when our method and the competitors have been chosen by the participants.

	Ours	AAD	BDS	Cropping	F-MultiOp	PBW	Shift-Map
Figure 23	**34.55**%	20.00%	12.73%	9.09%	27.27%	29.09%	12.73%



(a) Original (b) Texture Mask (c) Saliency Map

(d) Ours (e) AAD [6] (f) BDS [7]

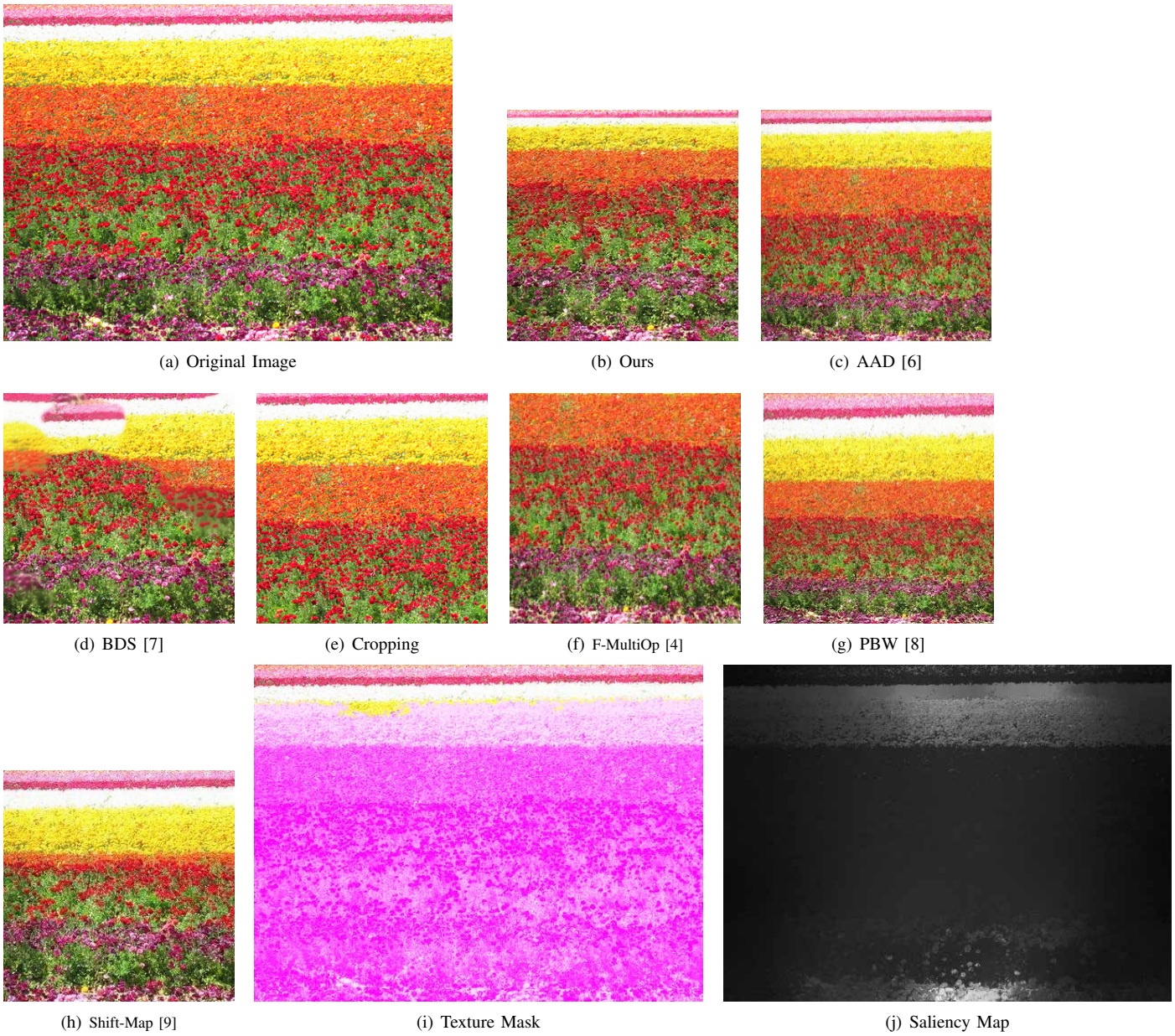
(g) Cropping (h) F-MultiOp [4] (i) PBW [8]

(j) Shift-Map [9]

Fig. 24. Input resolution is 344×500, output resolution is 344×310.

TABLE 22
User study. We show the percentages when our method and the competitors have been chosen by the participants.

	Ours	AAD	BDS	Cropping	F-MultiOp	PBW	Shift-Map
Figure 24	**80.00%**	1.82%	14.55%	25.45%	10.91%	3.64%	0.00%



(a) Original Image (b) Ours (c) AAD [6]

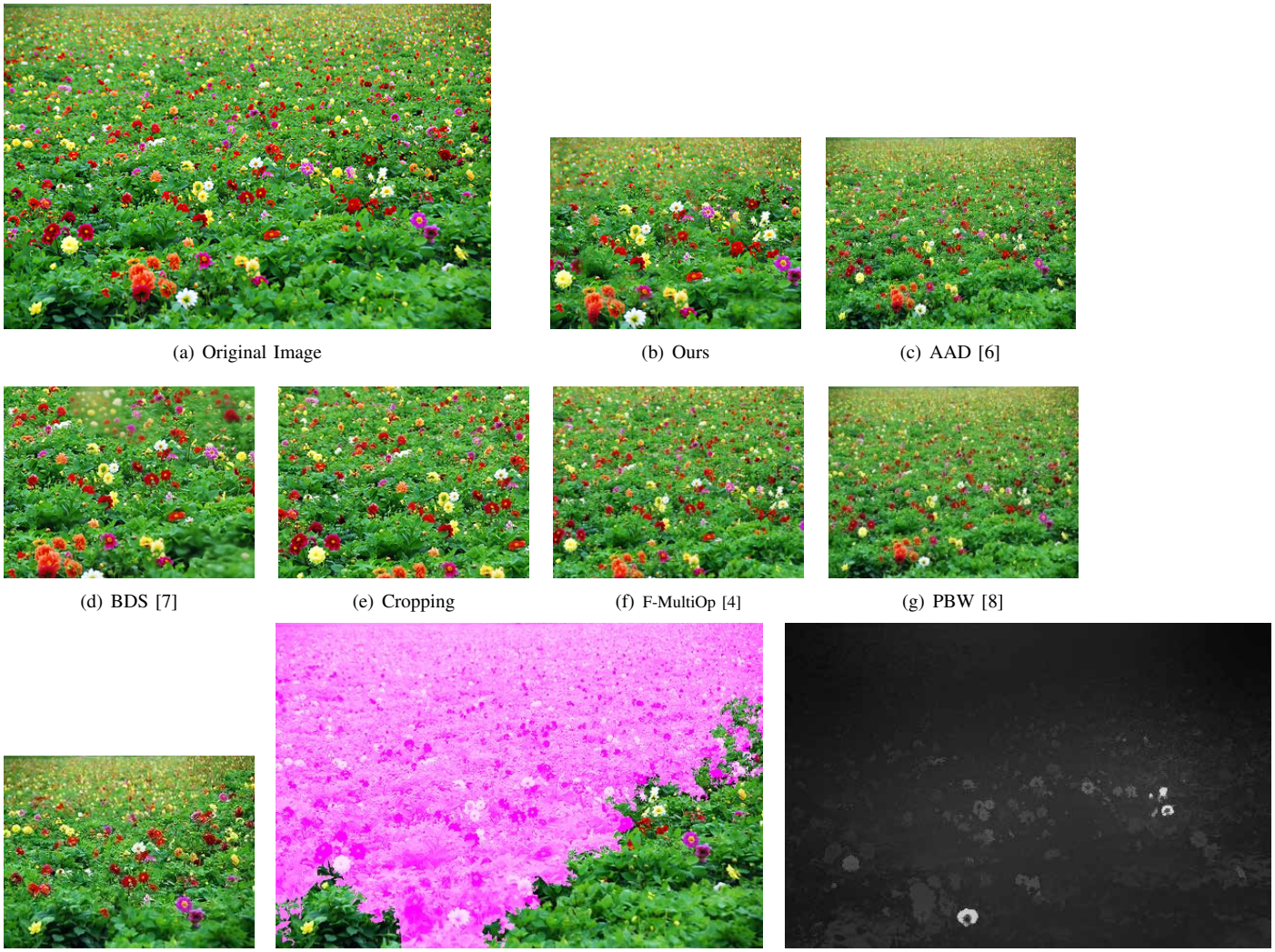
(d) BDS [7] (e) Cropping (f) F-MultiOp [4] (g) PBW [8]

(h) Shift-Map [9] (i) Texture Mask (j) Saliency Map

Fig. 25. Input resolution is 500×375, output resolution is 260×260.

TABLE 23
User study. We show the percentages when our method and the competitors have been chosen by the participants.

	Ours	AAD	BDS	Cropping	F-MultiOp	PBW	Shift-Map
Figure 25	**45.45**%	30.91%	0.00%	18.18%	3.64%	34.55%	9.09%



(a) Original Image (b) Ours (c) AAD [6]

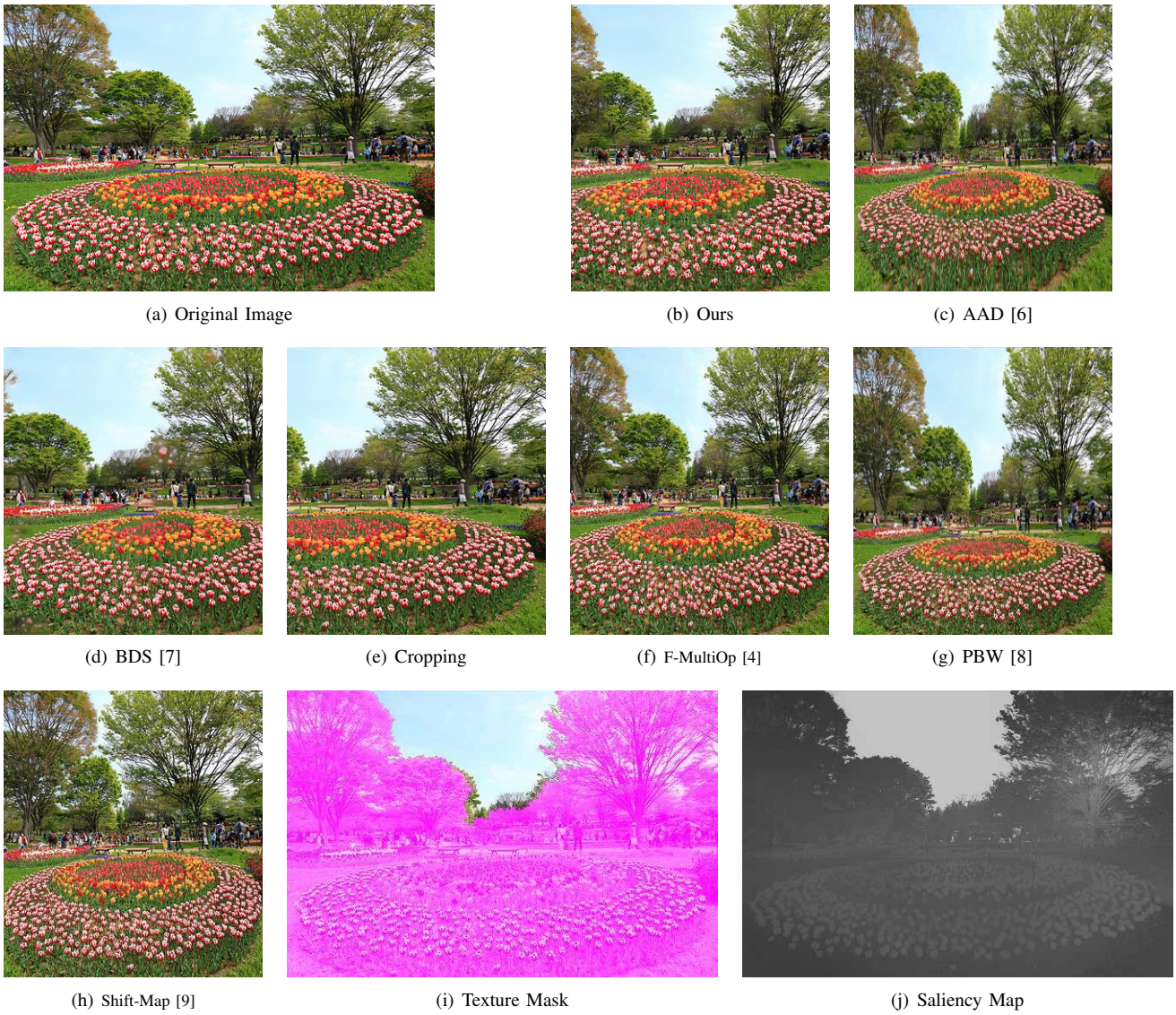
(d) BDS [7] (e) Cropping (f) F-MultiOp [4] (g) PBW [8]

(h) Shift-Map [9] (i) Texture Mask (j) Saliency Map

Fig. 26. Input resolution is 500×334, output resolution is 260×200.

TABLE 24
User study. We show the percentages when our method and the competitors have been chosen by the participants.

	Ours	AAD	BDS	Cropping	F-MultiOp	PBW	Shift-Map
Figure 26	**49.09%**	21.82%	16.36%	32.73%	10.91%	5.45%	7.27%



(a) Original Image (b) Ours (c) AAD [6]

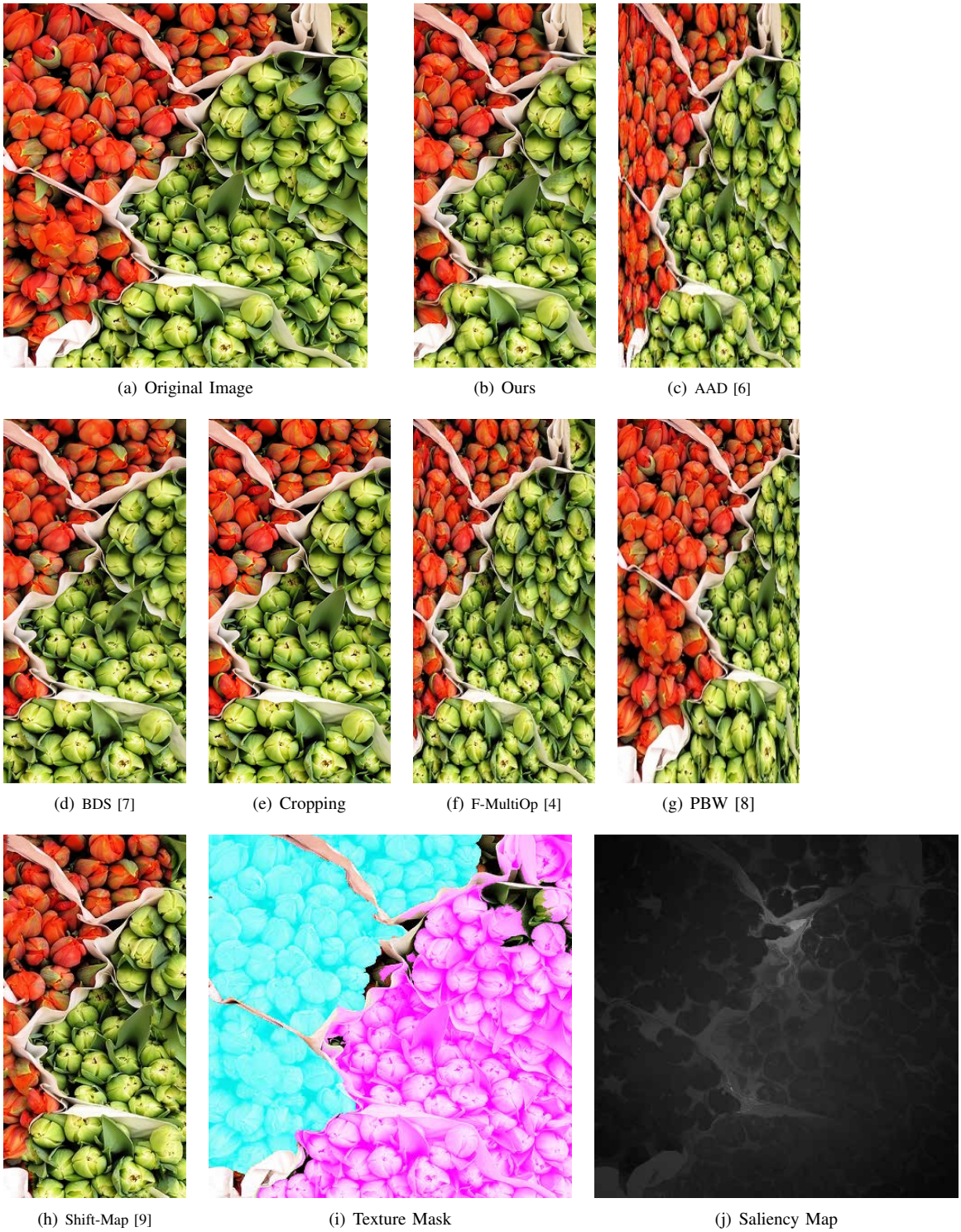
(d) BDS [7] (e) Cropping (f) F-MultiOp [4] (g) PBW [8]

(h) Shift-Map [9] (i) Texture Mask (j) Saliency Map

Fig. 27. Input resolution is 500×333, output resolution is 300×333.

TABLE 25
User study. We show the percentages when our method and the competitors have been chosen by the participants.

	Ours	AAD	BDS	Cropping	F-MultiOp	PBW	Shift-Map
Figure 27	**27.27**%	14.55%	14.55%	12.73%	34.55%	18.18%	23.64%



(a) Original Image (b) Ours (c) AAD [6]

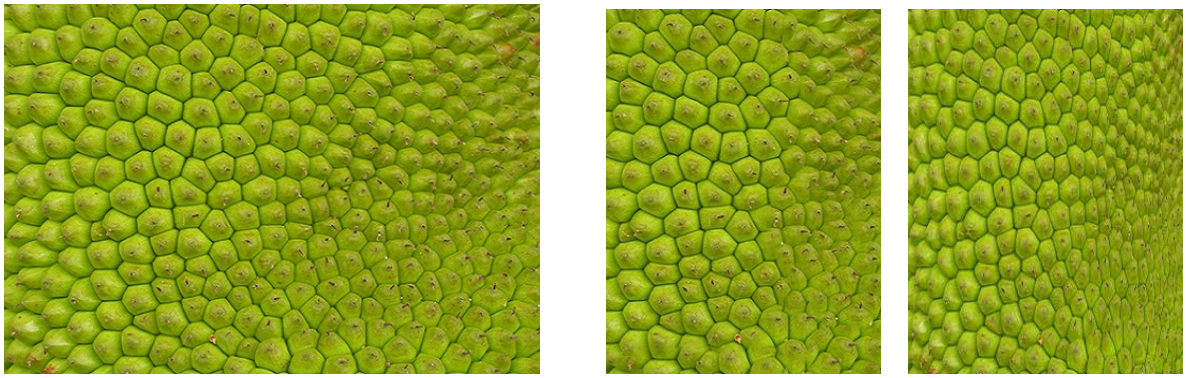
(d) BDS [7] (e) Cropping (f) F-MultiOp [4] (g) PBW [8]

(h) Shift-Map [9] (i) Texture Mask (j) Saliency Map

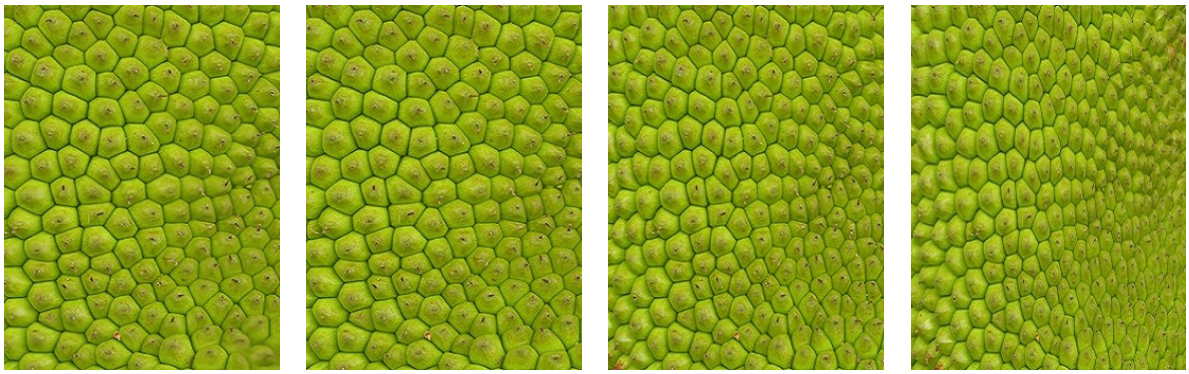
Fig. 28. Input resolution is 400×400, output resolution is 200×400.

TABLE 26
User study. We show the percentages when our method and the competitors have been chosen by the participants.

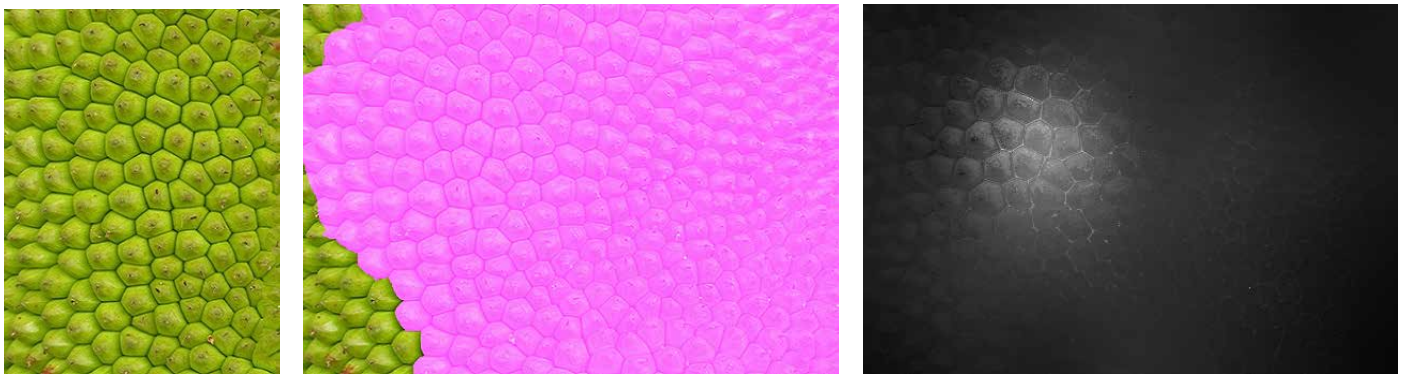
	Ours	AAD	BDS	Cropping	F-MultiOp	PBW	Shift-Map
Figure 28	**52.73**%	0.00%	18.18%	32.73%	7.27%	9.09%	25.45%



(a) Original Image (b) Ours (c) AAD [6]



(d) BDS [7] (e) Cropping (f) F-MultiOp [4] (g) PBW [8]



(h) Shift-Map [9] (i) Texture Mask (j) Saliency Map

Fig. 29. Input resolution is 500×345, output resolution is 260×345.

TABLE 27
User study. We show the percentages when our method and the competitors have been chosen by the participants.

	Ours	AAD	BDS	Cropping	F-MultiOp	PBW	Shift-Map
Figure 29	**30.91**%	9.09%	25.45%	34.55%	10.91%	0.00%	27.27%

(a) Original Image

(b) Ours

(c) AAD [6]

(d) BDS [7]

(e) Cropping

(f) F-MultiOp [4]

(g) PBW [8]

(h) Shift-Map [9]

(i) Texture Mask

(j) Saliency Map

Fig. 30. Input resolution is 500×332, output resolution is 260×332.

TABLE 28
User study. We show the percentages when our method and the competitors have been chosen by the participants.

	Ours	AAD	BDS	Cropping	F-MultiOp	PBW	Shift-Map
Figure 30	**56.36%**	5.45%	23.64%	20.00%	9.09%	7.27%	20.00%

(a) Original (b) Texture Mask (c) Saliency Map

(d) Ours (e) AAD [6] (f) BDS [7]

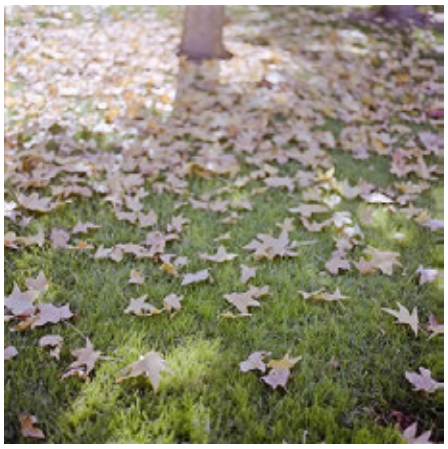
(g) Cropping (h) F-MultiOp [4] (i) PBW [8]

(j) Shift-Map [9]

Fig. 31. Input resolution is 333×500, output resolution is 333×250.

TABLE 29
User study. We show the percentages when our method and the competitors have been chosen by the participants.

	Ours	AAD	BDS	Cropping	F-MultiOp	PBW	Shift-Map
Figure 31	**67.27**%	5.45%	3.64%	56.36%	0.00%	0.00%	0.00%



(a) Original Image

(b) Texture Mask

(c) Saliency Map

(d) Ours

(e) AAD [6]

(f) BDS [7]

(g) Cropping

(h) F-MultiOp [4]

(i) PBW [8]

(j) Shift-Map [9]

Fig. 32. Input resolution is 400×400, output resolution is 240×240.

TABLE 30
User study. We show the percentages when our method and the competitors have been chosen by the participants.

	Ours	AAD	BDS	Cropping	F-MultiOp	PBW	Shift-Map
Figure 32	**41.82%**	30.91%	3.64%	14.55%	5.45%	41.82%	3.64%

(a) Original Image

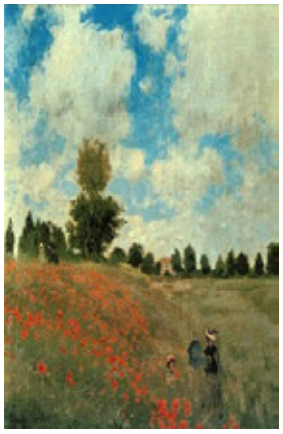
(b) Ours

(c) AAD [6]

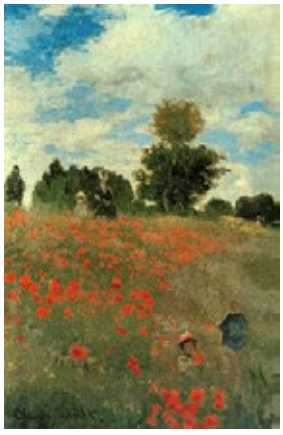
(d) BDS [7]

(e) Cropping

(f) F-MultiOp [4]



(g) PBW [8]



(h) Shift-Map [9]

(i) Texture Mask

(j) Saliency Map

Fig. 33. Input resolution is 466×360, output resolution is 233×360.

TABLE 31
User study. We show the percentages when our method and the competitors have been chosen by the participants.

	Ours	AAD	BDS	Cropping	F-MultiOp	PBW	Shift-Map
Figure 33	**40.00%**	0.00%	36.36%	30.91%	3.64%	7.27%	34.55%

(a) Original Image (b) Ours (c) AAD [6]

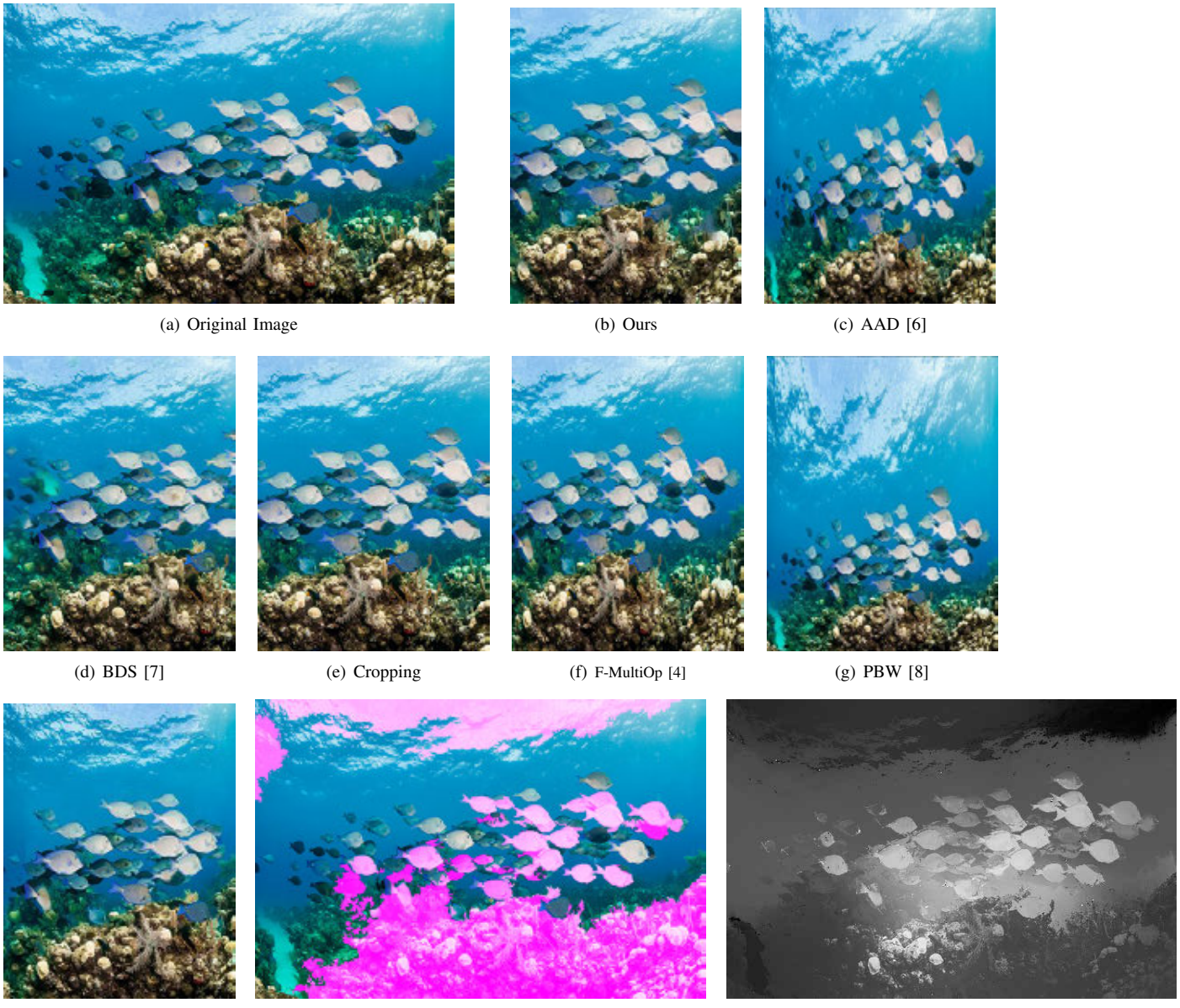
(d) BDS [7] (e) Cropping (f) F-MultiOp [4] (g) PBW [8]

(h) Shift-Map [9] (i) Texture Mask (j) Saliency Map

Fig. 34. Input resolution is 500×335, output resolution is 330×332.

TABLE 32
User study. We show the percentages when our method and the competitors have been chosen by the participants.

	Ours	AAD	BDS	Cropping	F-MultiOp	PBW	Shift-Map
Figure 34	**60.00**%	12.73%	10.91%	20.00%	10.91%	12.73%	7.27%



(a) Original Image (b) Ours (c) AAD [6]

(d) BDS [7] (e) Cropping (f) F-MultiOp [4] (g) PBW [8]

(h) Shift-Map [9] (i) Texture Mask (j) Saliency Map

Fig. 35. Input resolution is 500×332, output resolution is 260×332.

TABLE 33
User study. We show the percentages when our method and the competitors have been chosen by the participants.

	Ours	AAD	BDS	Cropping	F-MultiOp	PBW	Shift-Map
Figure 35	**38.18**%	10.91%	18.18%	30.91%	23.64%	1.82%	23.64%

(a) Original Image (b) Ours (c) AAD [6]

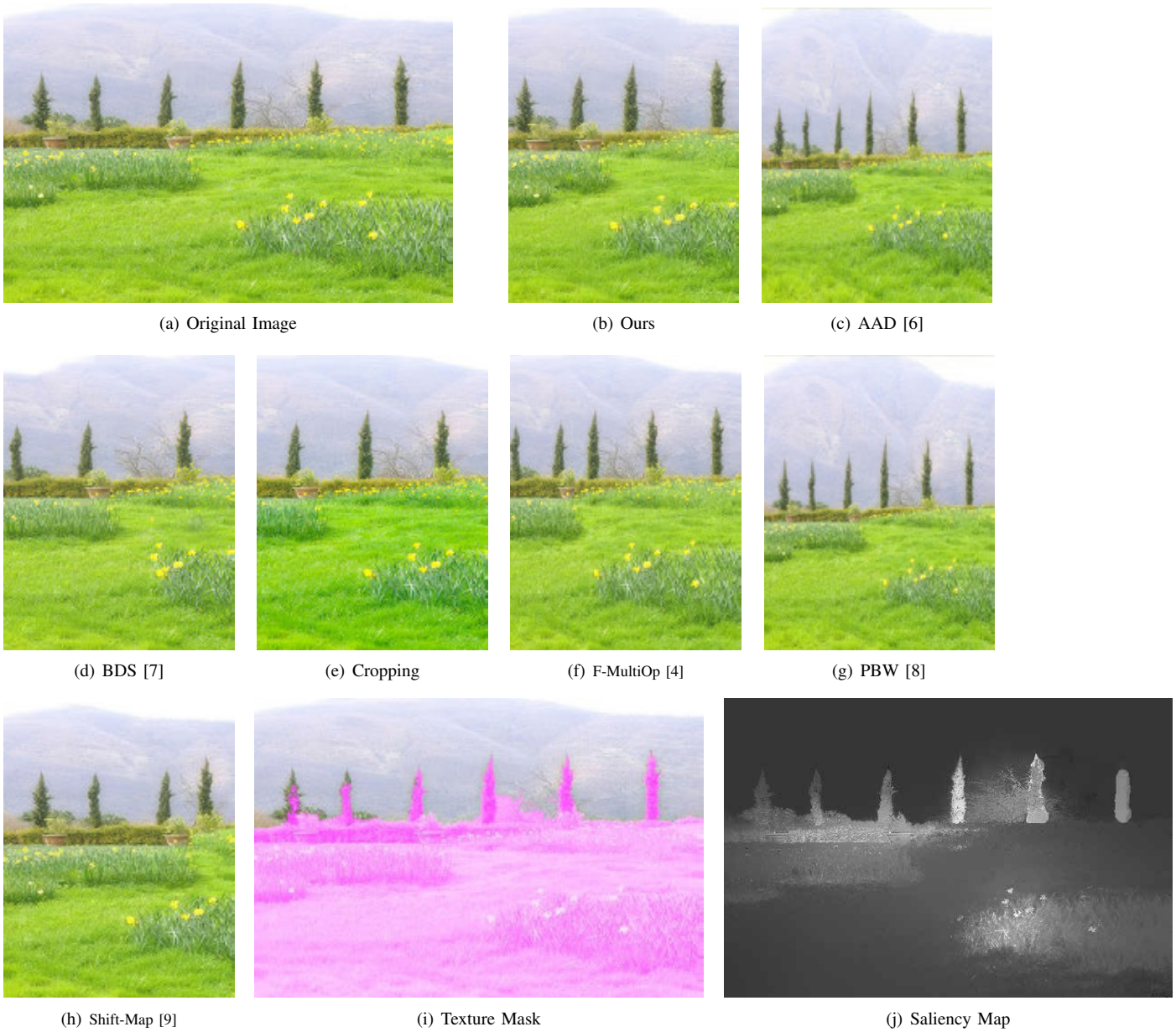
(d) BDS [7] (e) Cropping (f) F-MultiOp [4] (g) PBW [8]

(h) Shift-Map [9] (i) Texture Mask (j) Saliency Map

Fig. 36. Input resolution is 500×313, output resolution is 260×313.

TABLE 34
User study. We show the percentages when our method and the competitors have been chosen by the participants.

	Ours	AAD	BDS	Cropping	F-MultiOp	PBW	Shift-Map
Figure 36	**52.73**%	16.36%	16.36%	32.73%	16.36%	5.45%	3.64%



(a) Original Image (b) Ours (c) AAD [6]

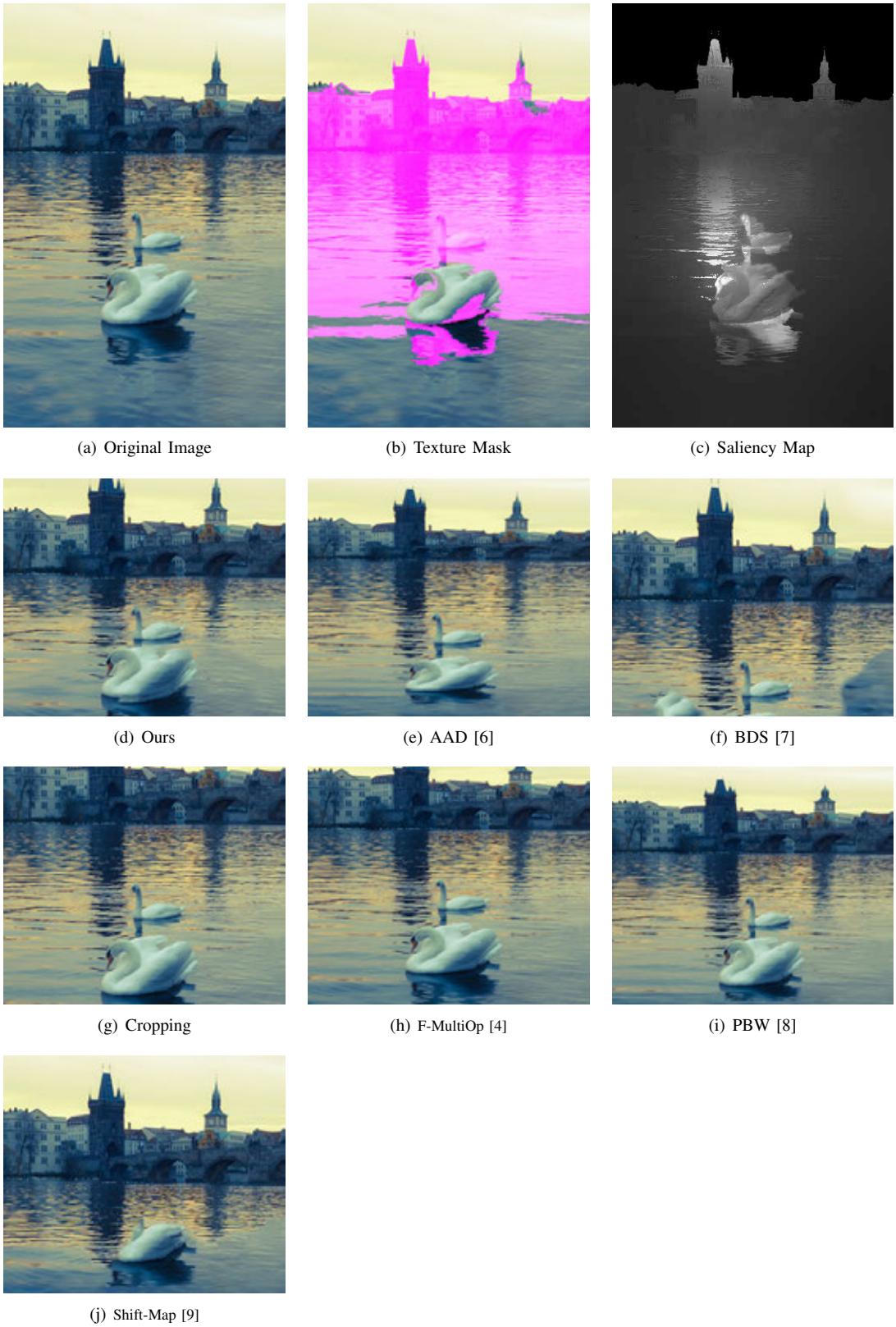
(d) BDS [7] (e) Cropping (f) F-MultiOp [4] (g) PBW [8]

(h) Shift-Map [9] (i) Texture Mask (j) Saliency Map

Fig. 37. Input resolution is 500×333, output resolution is 260×333.

TABLE 35
User study. We show the percentages when our method and the competitors have been chosen by the participants.

	Ours	AAD	BDS	Cropping	F-MultiOp	PBW	Shift-Map
Figure 37	**41.82%**	21.82%	7.27%	16.36%	5.45%	9.09%	36.36%



(a) Original Image (b) Texture Mask (c) Saliency Map

(d) Ours (e) AAD [6] (f) BDS [7]

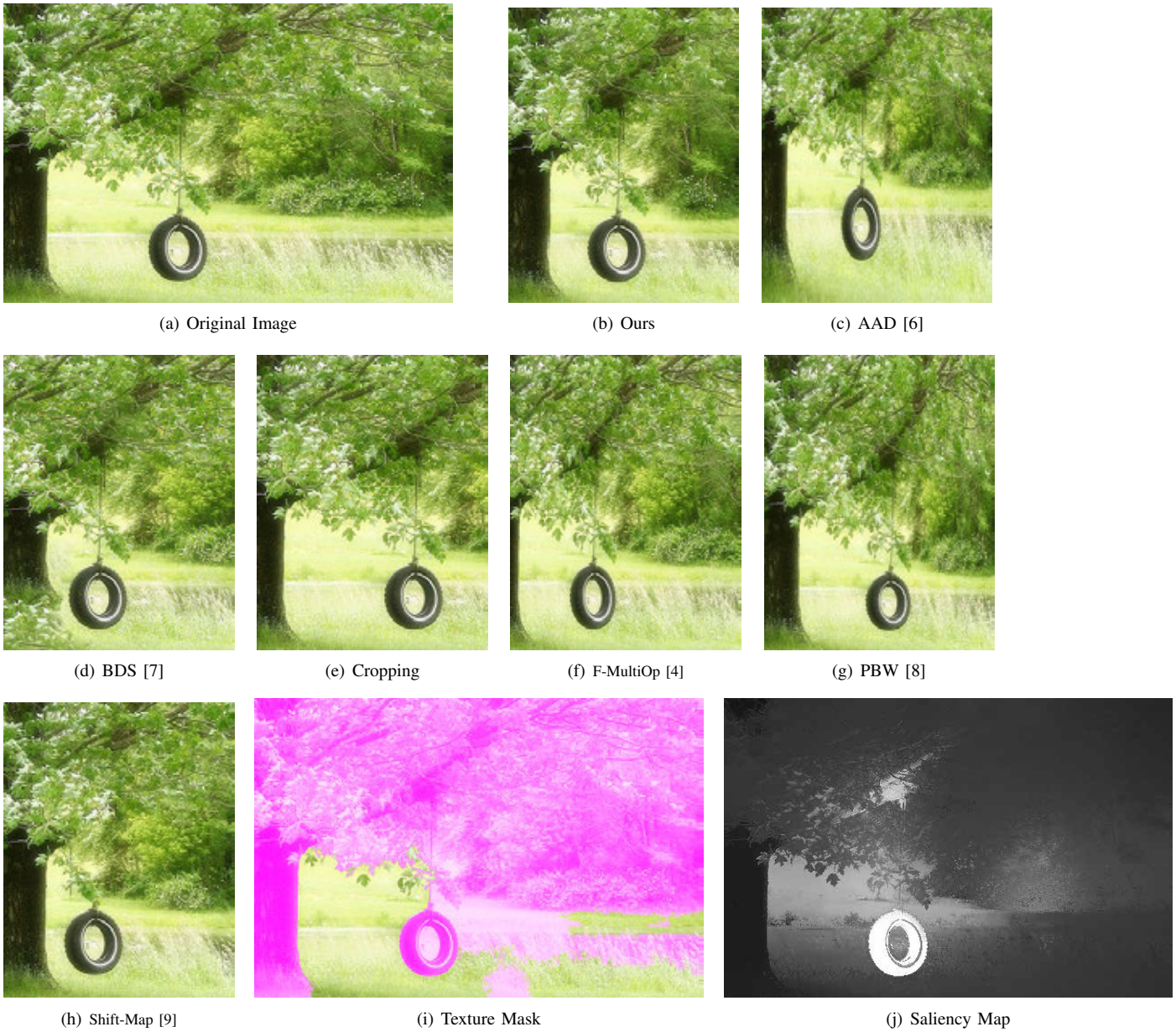
(g) Cropping (h) F-MultiOp [4] (i) PBW [8]

(j) Shift-Map [9]

Fig. 38. Input resolution is 332×500, output resolution is 280×332.

TABLE 36
User study. We show the percentages when our method and the competitors have been chosen by the participants.

	Ours	AAD	BDS	Cropping	F-MultiOp	PBW	Shift-Map
Figure 38	**54.55**%	23.64%	9.09%	9.09%	5.45%	29.09%	0.00%



(a) Original Image (b) Ours (c) AAD [6]

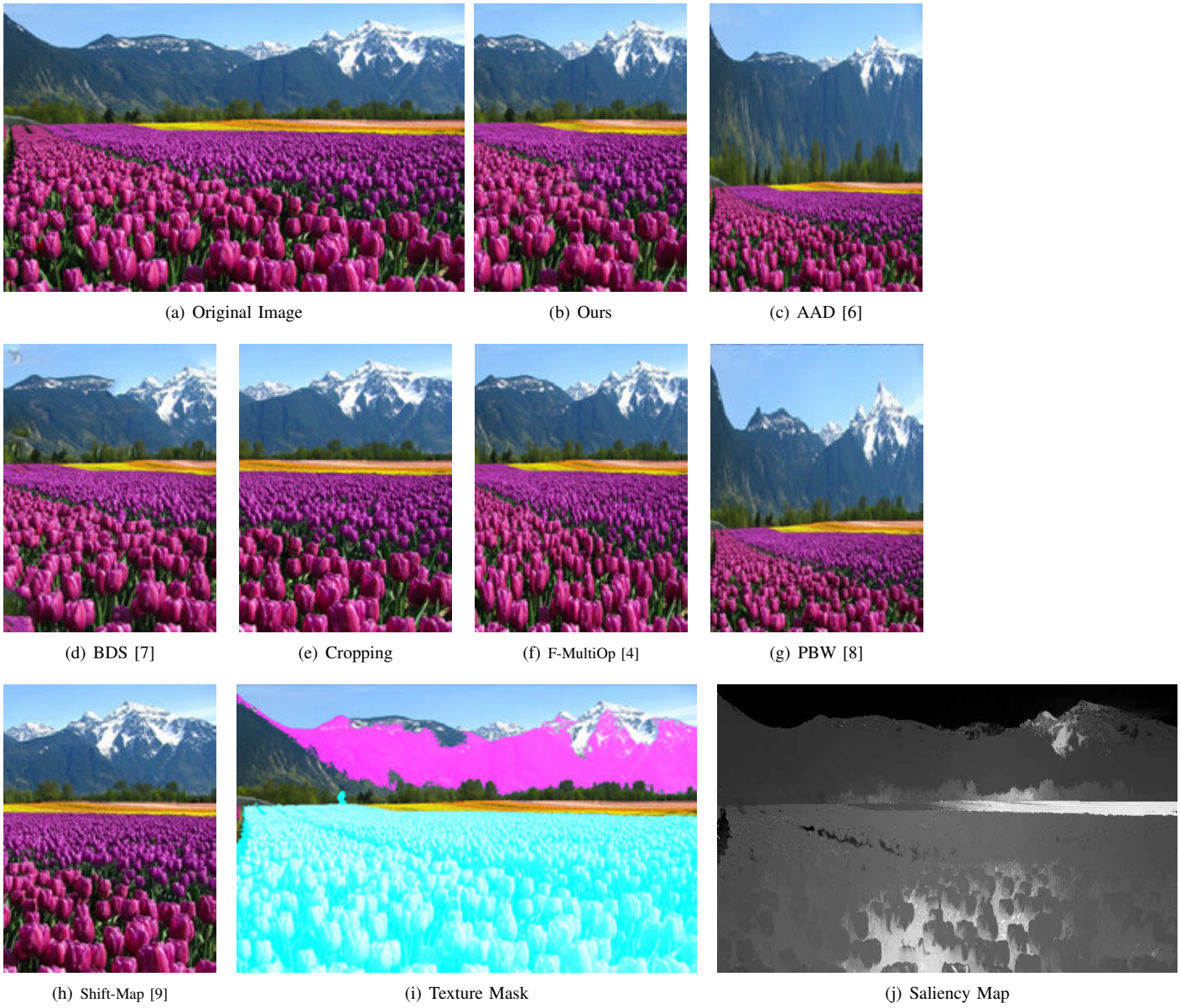
(d) BDS [7] (e) Cropping (f) F-MultiOp [4] (g) PBW [8]

(h) Shift-Map [9] (i) Texture Mask (j) Saliency Map

Fig. 39. Input resolution is 500×333, output resolution is 260×330.

TABLE 37
User study. We show the percentages when our method and the competitors have been chosen by the participants.

	Ours	AAD	BDS	Cropping	F-MultiOp	PBW	Shift-Map
Figure 39	**63.64%**	0.00%	0.00%	34.55%	10.91%	18.18%	5.45%



(a) Original Image (b) Ours (c) AAD [6]

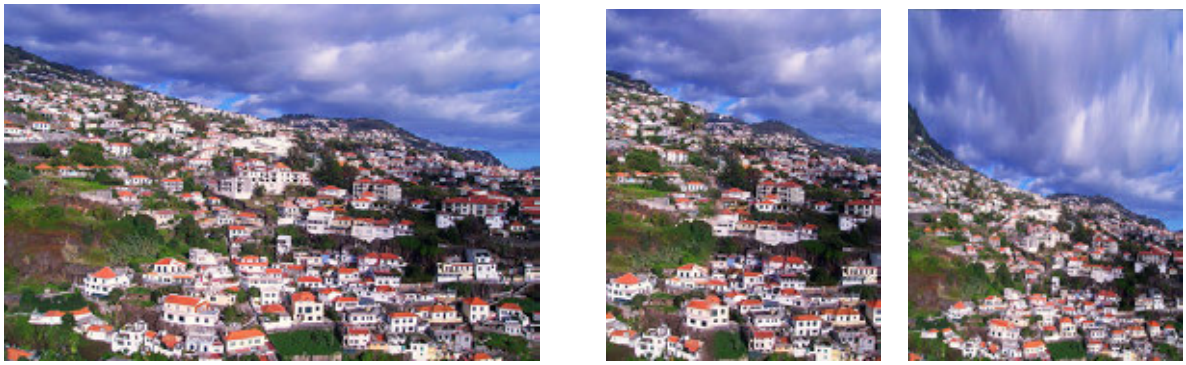
(d) BDS [7] (e) Cropping (f) F-MultiOp [4] (g) PBW [8]

(h) Shift-Map [9] (i) Texture Mask (j) Saliency Map

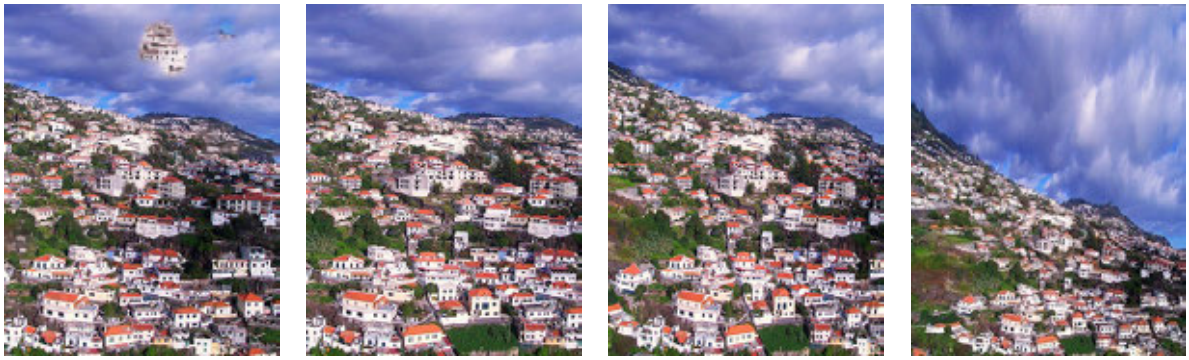
Fig. 40. Input resolution is 555×347, output resolution is 256×347.

TABLE 38
User study. We show the percentages when our method and the competitors have been chosen by the participants.

	Ours	AAD	BDS	Cropping	F-MultiOp	PBW	Shift-Map
Figure 40	**65.45%**	1.82%	16.36%	23.64%	21.82%	3.64%	25.45%



(a) Original Image (b) Ours (c) AAD [6]



(d) BDS [7] (e) Cropping (f) F-MultiOp [4] (g) PBW [8]

(h) Shift-Map [9] (i) Texture Mask (j) Saliency Map

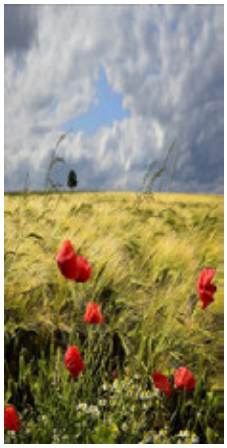
Fig. 41. Input resolution is 500×333, output resolution is 260×333.

TABLE 39
User study. We show the percentages when our method and the competitors have been chosen by the participants.

	Ours	AAD	BDS	Cropping	F-MultiOp	PBW	Shift-Map
Figure 41	**52.73**%	1.82%	0.00%	36.36%	38.18%	0.00%	5.45%

(a) Original Image

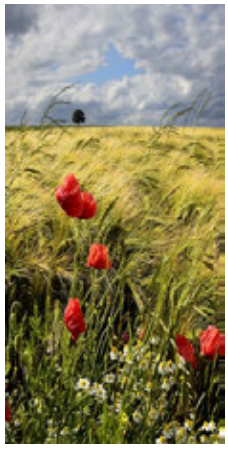
(b) Ours



(c) AAD [6]

(d) BDS [7]

(e) Cropping



(f) F-MultiOp [4]

(g) PBW [8]

(h) Shift-Map [9]

(i) Texture Mask

(j) Saliency Map

Fig. 42. Input resolution is 400×400, output resolution is 200×400.

TABLE 40
User study. We show the percentages when our method and the competitors have been chosen by the participants.

	Ours	AAD	BDS	Cropping	F-MultiOp	PBW	Shift-Map
Figure 42	**69.09%**	1.82%	29.09%	20.00%	16.36%	0.00%	3.64%

(a) Original (b) Texture Mask (c) Saliency Map

(d) Ours (e) AAD [6] (f) BDS [7]

(g) Cropping (h) F-MultiOp [4] (i) PBW [8]

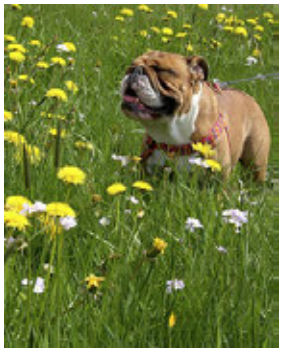
(j) Shift-Map [9]

Fig. 43. Input resolution is 340×500, output resolution is 340×300.

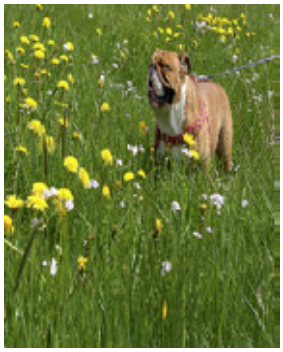
TABLE 41
User study. We show the percentages when our method and the competitors have been chosen by the participants.

	Ours	AAD	BDS	Cropping	F-MultiOp	PBW	Shift-Map
Figure 43	**47.27**%	5.45%	14.55%	49.09%	7.27%	0.00%	30.91%

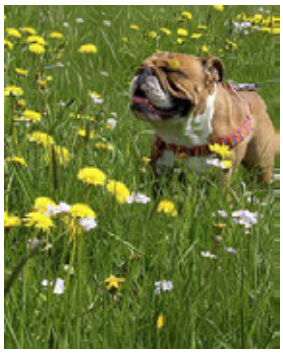
(a) Original Image



(b) Ours

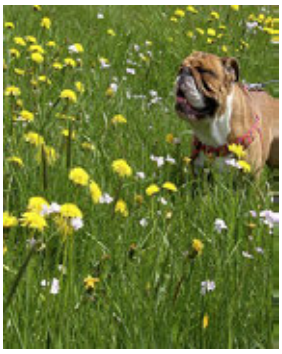


(c) AAD [6]

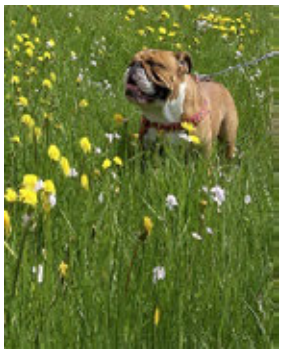


(d) BDS [7]

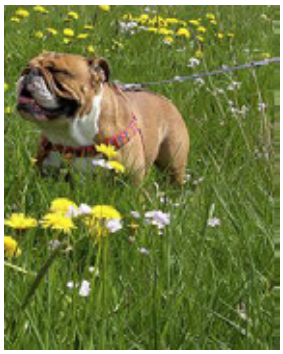
(e) Cropping



(f) F-MultiOp [4]



(g) PBW [8]



(h) Shift-Map [9]

(i) Texture Mask

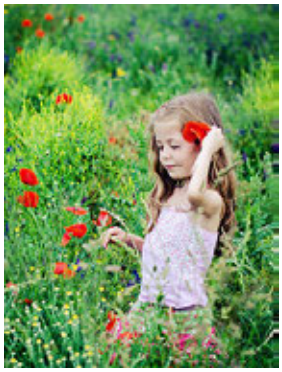
(j) Saliency Map

Fig. 44. Input resolution is 500×313, output resolution is 250×313.

TABLE 42
User study. We show the percentages when our method and the competitors have been chosen by the participants.

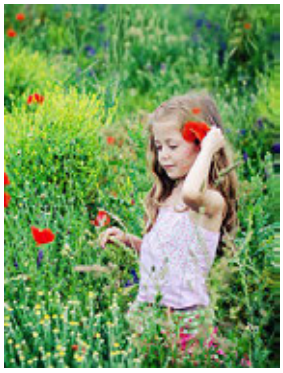
	Ours	AAD	BDS	Cropping	F-MultiOp	PBW	Shift-Map
Figure 44	**69.09%**	0.00%	30.91%	21.82%	9.09%	5.45%	12.73%

(a) Original Image

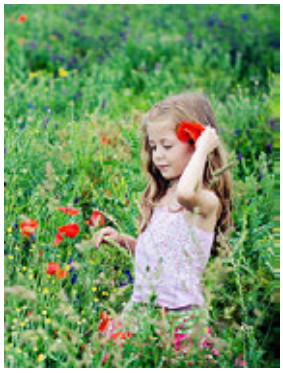


(b) Ours

(c) AAD [6]



(d) BDS [7]



(e) Cropping

(f) F-MultiOp [4]

(g) PBW [8]

(h) Shift-Map [9]

(i) Texture Mask

(j) Saliency Map

Fig. 45. Input resolution is 500×331, output resolution is 250×331.

TABLE 43
User study. We show the percentages when our method and the competitors have been chosen by the participants.

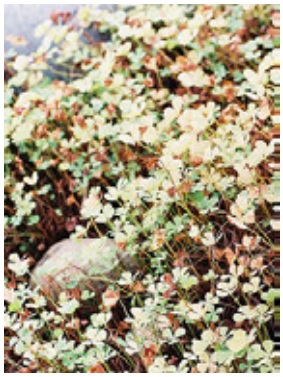
	Ours	AAD	BDS	Cropping	F-MultiOp	PBW	Shift-Map
Figure 45	**61.82**%	0.00%	23.64%	29.09%	14.55%	1.82%	14.55%

(a) Original Image

(b) Ours

(c) AAD [6]

(d) BDS [7]



(e) Cropping

(f) F-MultiOp [4]

(g) PBW [8]

(h) Shift-Map [9]

(i) Texture Mask

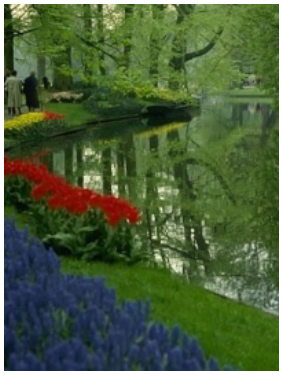
(j) Saliency Map

Fig. 46. Input resolution is 500×335, output resolution is 250×335.

TABLE 44
User study. We show the percentages when our method and the competitors have been chosen by the participants.

	Ours	AAD	BDS	Cropping	F-MultiOp	PBW	Shift-Map
Figure 46	**54.55**%	5.45%	7.27%	23.64%	0.00%	9.09%	50.91%

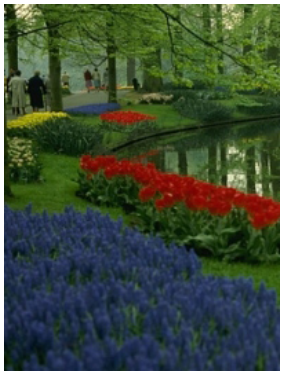
(a) Original Image



(b) Ours

(c) AAD [6]

(d) BDS [7]

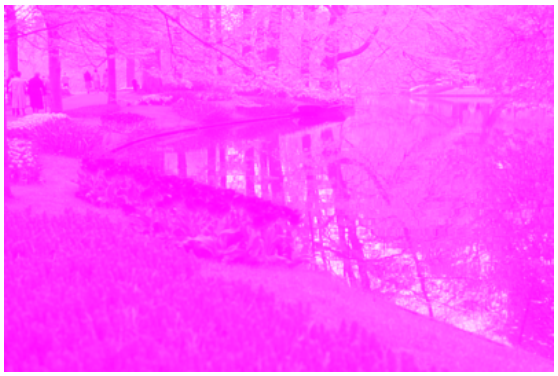


(e) Cropping

(f) F-MultiOp [4]

(g) PBW [8]

(h) Shift-Map [9]



(i) Texture Mask

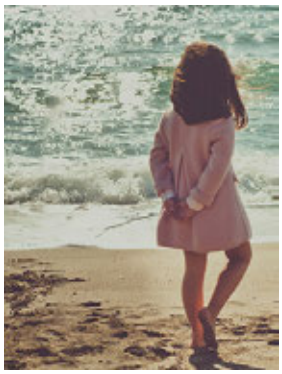
(j) Saliency Map

Fig. 47. Input resolution is 400×267, output resolution is 200×267.

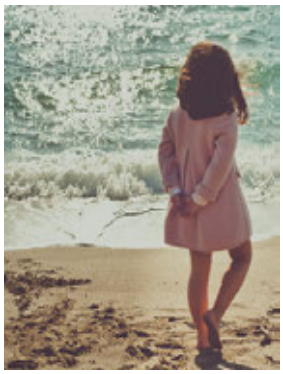
TABLE 45
User study. We show the percentages when our method and the competitors have been chosen by the participants.

	Ours	AAD	BDS	Cropping	F-MultiOp	PBW	Shift-Map
Figure 47	**43.64**%	18.18%	14.55%	20.00%	38.18%	37.27%	16.36%

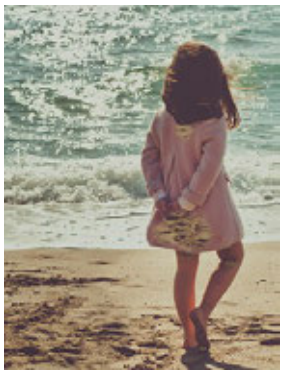
(a) Original Image



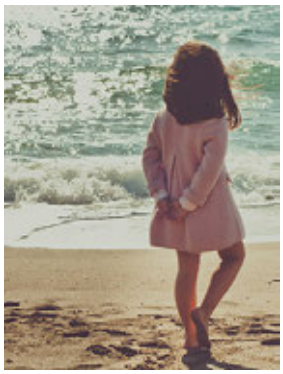
(b) Ours



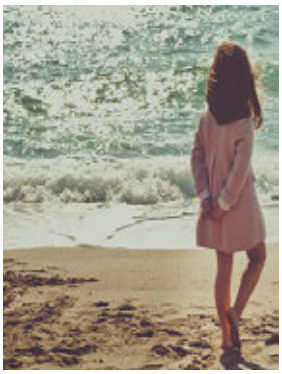
(c) AAD [6]



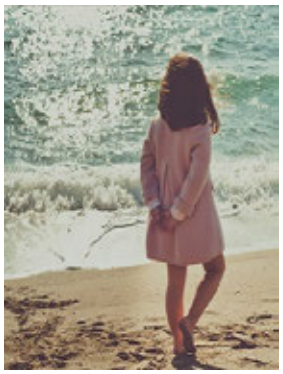
(d) BDS [7]



(e) Cropping



(f) F-MultiOp [4]



(g) PBW [8]

(h) Shift-Map [9]

(i) Texture Mask

(j) Saliency Map

Fig. 48. Input resolution is 500×332, output resolution is 250×332.

TABLE 46
User study. We show the percentages when our method and the competitors have been chosen by the participants.

	Ours	AAD	BDS	Cropping	F-MultiOp	PBW	Shift-Map
Figure 48	**58.18%**	25.45%	3.64%	41.82%	1.82%	20.00%	9.09%

(a) Original Image

(b) Ours

(c) AAD [6]

(d) BDS [7]

(e) Cropping

(f) F-MultiOp [4]

(g) PBW [8]

(h) Shift-Map [9]

(i) Texture Mask

(j) Saliency Map

Fig. 49. Input resolution is 500×333, output resolution is 250×333.

TABLE 47
User study. We show the percentages when our method and the competitors have been chosen by the participants.

	Ours	AAD	BDS	Cropping	F-MultiOp	PBW	Shift-Map
Figure 49	**60.00%**	16.36%	14.55%	21.82%	29.09%	3.64%	5.45%

(a) Original (b) Texture Mask (c) Saliency Map

(d) Ours (e) AAD [6] (f) BDS [7]

(g) Cropping (h) F-MultiOp [4] (i) PBW [8]

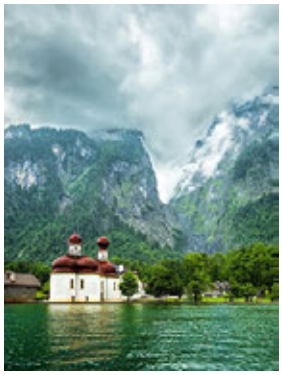
(j) Shift-Map [9]

Fig. 50. Input resolution is 358×500, output resolution is 358×300.

TABLE 48
User study. We show the percentages when our method and the competitors have been chosen by the participants.

	Ours	AAD	BDS	Cropping	F-MultiOp	PBW	Shift-Map
Figure 50	**65.45%**	7.27%	30.91%	20.00%	5.45%	0.00%	0.00%

(a) Original Image



(b) Ours

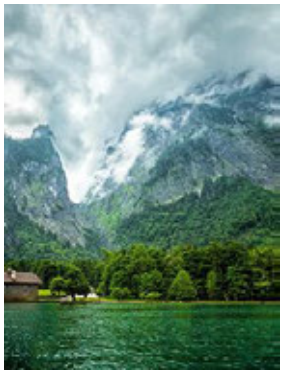
(c) AAD [6]

(d) BDS [7]

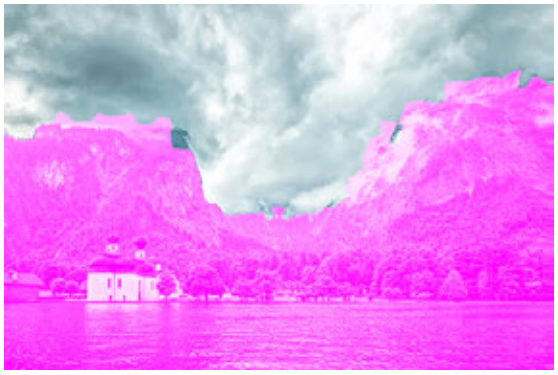
(e) Cropping

(f) F-MultiOp [4]

(g) PBW [8]



(h) Shift-Map [9]



(i) Texture Mask

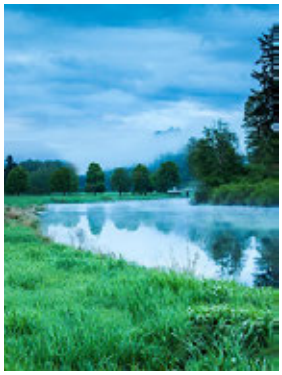
(j) Saliency Map

Fig. 51. Input resolution is 500×333, output resolution is 250×333.

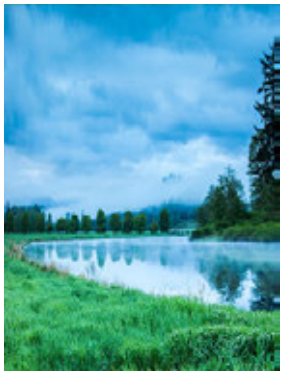
TABLE 49
User study. We show the percentages when our method and the competitors have been chosen by the participants.

	Ours	AAD	BDS	Cropping	F-MultiOp	PBW	Shift-Map
Figure 51	**58.18%**	21.82%	38.18%	9.09%	3.64%	18.18%	0.00%

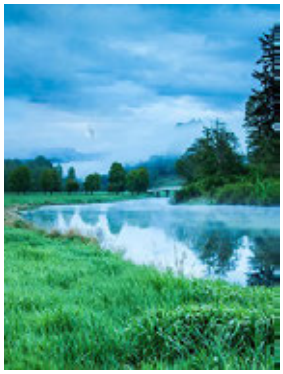
(a) Original Image



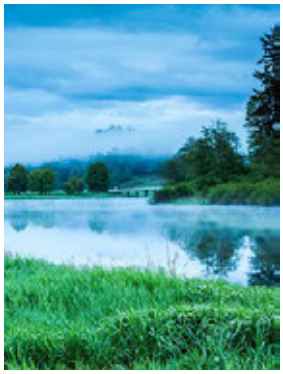
(b) Ours



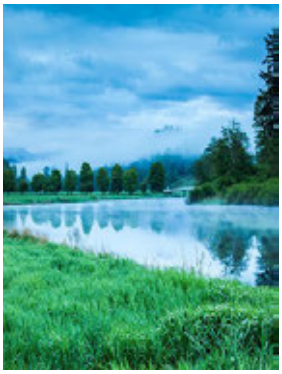
(c) AAD [6]



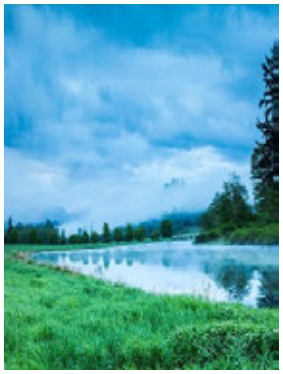
(d) BDS [7]



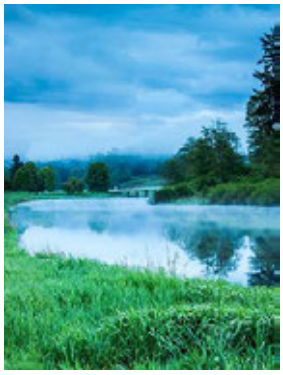
(e) Cropping



(f) F-MultiOp [4]



(g) PBW [8]



(h) Shift-Map [9]

(i) Texture Mask

(j) Saliency Map

Fig. 52. Input resolution is 500×333, output resolution is 250×333.

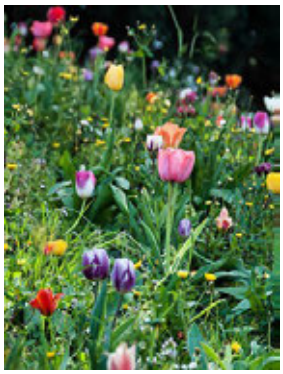
TABLE 50
User study. We show the percentages when our method and the competitors have been chosen by the participants.

	Ours	AAD	BDS	Cropping	F-MultiOp	PBW	Shift-Map
Figure 52	**49.09%**	29.09%	14.55%	10.91%	38.18%	12.73%	1.82%

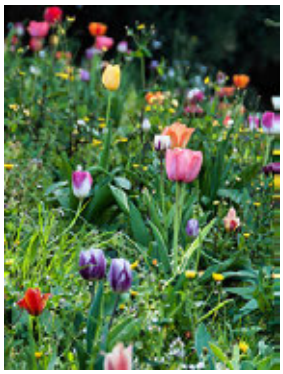
(a) Original Image

(b) Ours

(c) AAD [6]



(d) BDS [7]

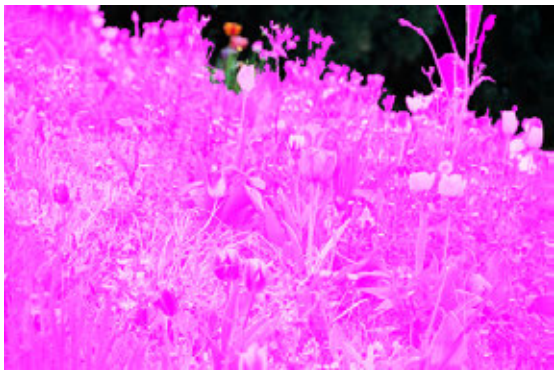


(e) Cropping

(f) F-MultiOp [4]

(g) PBW [8]

(h) Shift-Map [9]



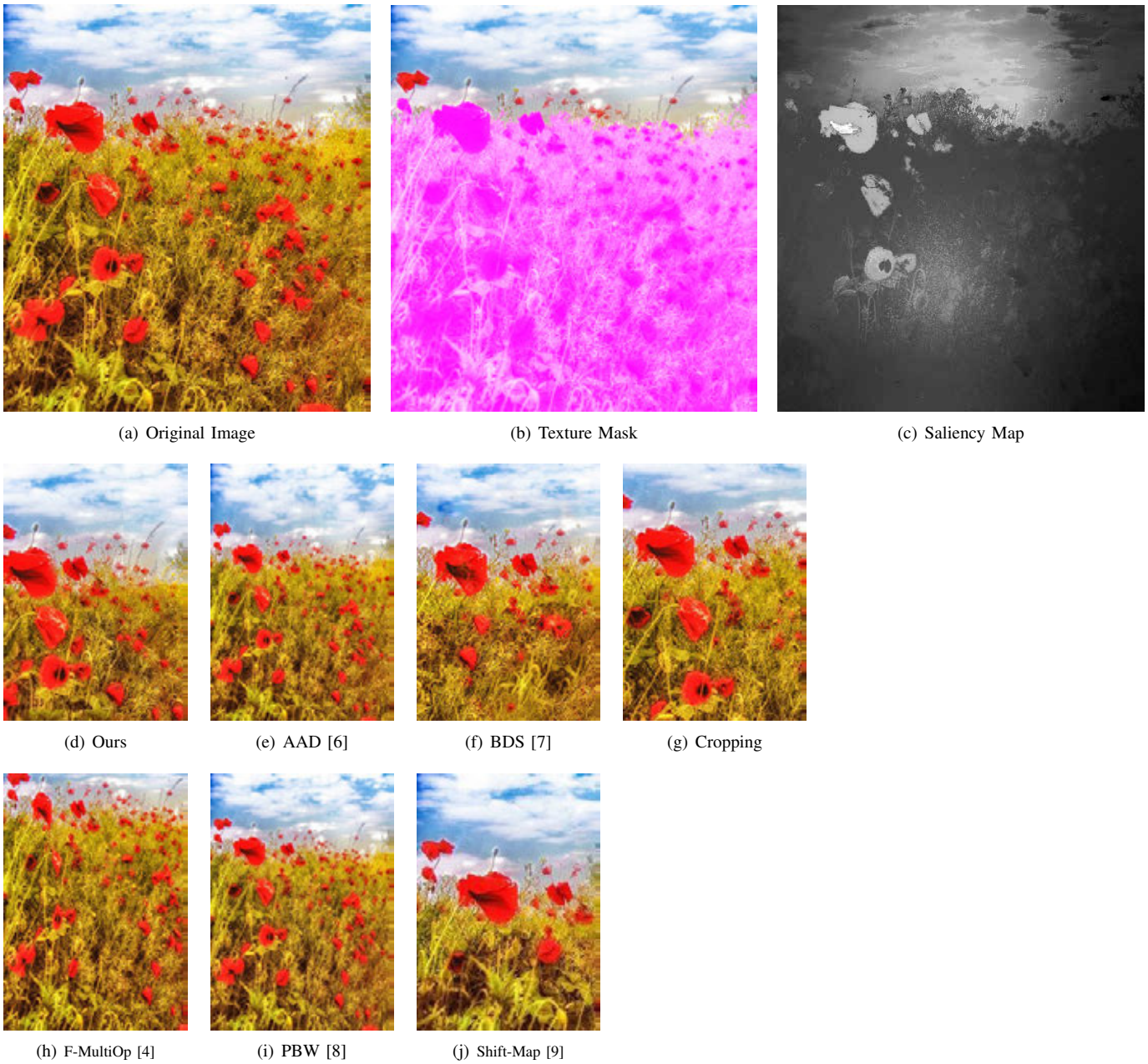
(i) Texture Mask

(j) Saliency Map

Fig. 53. Input resolution is 500×332, output resolution is 250×333.

TABLE 51
User study. We show the percentages when our method and the competitors have been chosen by the participants.

	Ours	AAD	BDS	Cropping	F-MultiOp	PBW	Shift-Map
Figure 53	**56.36**%	5.45%	18.18%	21.82%	10.91%	5.45%	27.27%



(a) Original Image (b) Texture Mask (c) Saliency Map

(d) Ours (e) AAD [6] (f) BDS [7] (g) Cropping

(h) F-MultiOp [4] (i) PBW [8] (j) Shift-Map [9]

Fig. 54. Input resolution is 360×400, output resolution is 180×252.

TABLE 52
User study. We show the percentages when our method and the competitors have been chosen by the participants.

	Ours	AAD	BDS	Cropping	F-MultiOp	PBW	Shift-Map
Figure 54	**41.82%**	20.00%	10.91%	34.55%	0.00%	32.73%	3.64%

(a) Original Image

(b) Ours

(c) AAD [6]

(d) BDS [7]

(e) Cropping

(f) F-MultiOp [4]

(g) PBW [8]

(h) Shift-Map [9]

(i) Texture Mask

(j) Saliency Map

Fig. 55. Input resolution is 500×340, output resolution is 250×340.

TABLE 53
User study. We show the percentages when our method and the competitors have been chosen by the participants.

	Ours	AAD	BDS	Cropping	F-MultiOp	PBW	Shift-Map
Figure 55	**45.45%**	20.00%	5.45%	29.09%	23.64%	3.64%	1.82%

(a) Original Image

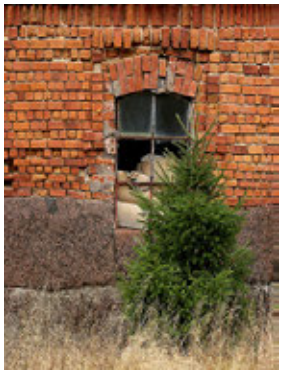
(b) Ours

(c) AAD [6]

(d) BDS [7]

(e) Cropping

(f) F-MultiOp [4]



(g) PBW [8]

(h) Shift-Map [9]

(i) Texture Mask

(j) Saliency Map

Fig. 56. Input resolution is 500×333, output resolution is 250×333.

TABLE 54
User study. We show the percentages when our method and the competitors have been chosen by the participants.

	Ours	AAD	BDS	Cropping	F-MultiOp	PBW	Shift-Map
Figure 56	**60.00%**	0.00%	10.91%	38.18%	0.00%	9.09%	14.55%

(a) Original Image

(b) Ours

(c) AAD [6]

(d) BDS [7]

(e) Cropping

(f) MultiOp [10]

(g) PBW [8]

(h) Shift-Map [9]

(i) Texture Mask

(j) Saliency Map

Fig. 57. Input resolution is 460×300, output resolution is 230×300.

TABLE 55
User study. We show the percentages when our method and the competitors have been chosen by the participants.

	Ours	AAD	BDS	Cropping	F-MultiOp	PBW	Shift-Map
Figure 57	**43.64%**	7.27%	38.18%	29.09%	23.64%	16.36%	1.82%

(a) Original Image

(b) Ours

(c) AAD [6]

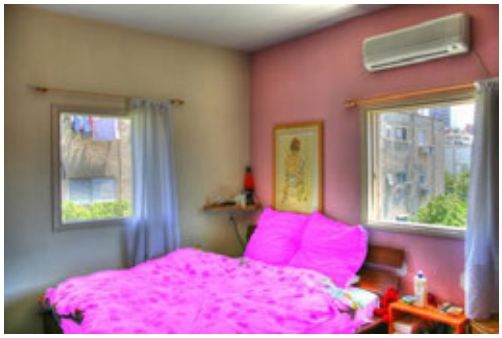
(d) BDS [7]

(e) Cropping

(f) MultiOp [10]

(g) PBW [8]

(h) Shift-Map [9]



(i) Texture Mask

(j) Saliency Map

Fig. 58. Input resolution is 500×333, output resolution is 375×333.

TABLE 56
User study. We show the percentages when our method and the competitors have been chosen by the participants.

	Ours	AAD	BDS	Cropping	F-MultiOp	PBW	Shift-Map
Figure 58	**81.82**%	30.91%	0.00%	16.36%	29.09%	34.55%	0.00%

(a) Original Image

(b) Ours

(c) AAD [6]

(d) BDS [7]

(e) Cropping

(f) MultiOp [10]

(g) PBW [8]

(h) Shift-Map [9]

(i) Texture Mask

(j) Saliency Map

Fig. 59. Input resolution is 500×332, output resolution is 375×332.

TABLE 57
User study. We show the percentages when our method and the competitors have been chosen by the participants.

	Ours	AAD	BDS	Cropping	MultiOp	PBW	Shift-Map
Figure 59	38.18%	**41.82%**	0.00%	5.45%	25.45%	38.18%	0.00%

(a) Original Image

(b) Ours

(c) AAD [6]

(d) BDS [7]

(e) Cropping

(f) MultiOp [10]

(g) PBW [8]

(h) Shift-Map [9]

(i) Texture Mask

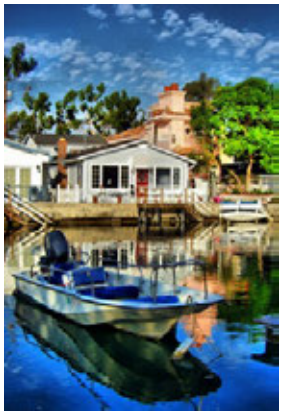
(j) Saliency Map

Fig. 60. Input resolution is 500×330, output resolution is 250×330.

TABLE 58
User study. We show the percentages when our method and the competitors have been chosen by the participants.

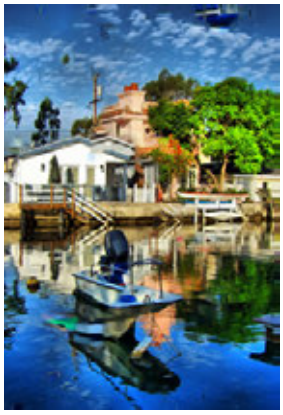
	Ours	AAD	BDS	Cropping	MultiOp	PBW	Shift-Map
Figure 60	32.73%	16.36%	0.00%	**43.64%**	29.09%	34.55%	20.00%

(a) Original Image



(b) Ours

(c) AAD [6]



(d) BDS [7]

(e) Cropping

(f) MultiOp [10]

(g) PBW [8]

(h) Shift-Map [9]

(i) Texture Mask

(j) Saliency Map

Fig. 61. Input resolution is 460×340, output resolution is 230×340.

TABLE 59
User study. We show the percentages when our method and the competitors have been chosen by the participants.

	Ours	AAD	BDS	Cropping	MultiOp	PBW	Shift-Map
Figure 61	**52.73**%	23.64%	0.00%	40.00%	27.27%	21.82%	3.64%

(a) Original Image

(b) Ours

(c) AAD [6]

(d) BDS [7]

(e) Cropping

(f) MultiOp [10]

(g) PBW [8]

(h) Shift-Map [9]

(i) Texture Mask

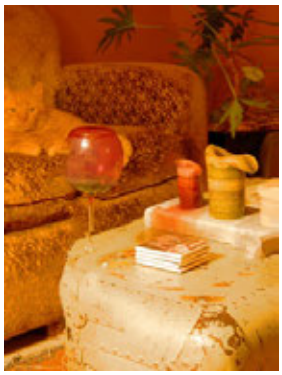
(j) Saliency Map

Fig. 62. Input resolution is 472×348, output resolution is 354×348.

TABLE 60
User study. We show the percentages when our method and the competitors have been chosen by the participants.

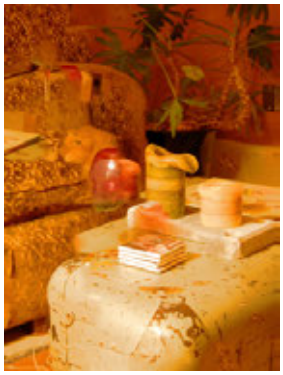
	Ours	AAD	BDS	Cropping	MultiOp	PBW	Shift-Map
Figure 62	**56.36**%	25.45%	0.00%	16.36%	43.64%	30.91%	0.00%

(a) Original Image

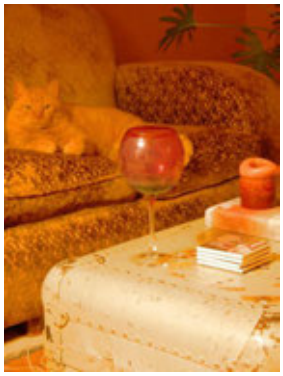


(b) Ours

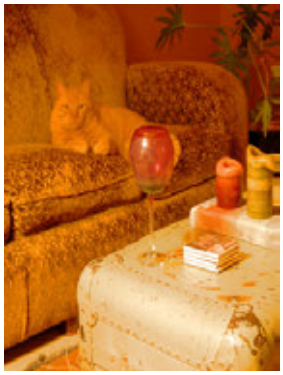
(c) AAD [6]



(d) BDS [7]

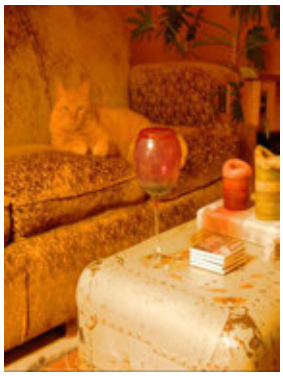


(e) Cropping



(f) MultiOp [10]

(g) PBW [8]



(h) Shift-Map [9]

(i) Texture Mask

(j) Saliency Map

Fig. 63. Input resolution is 472×348, output resolution is 354×348.

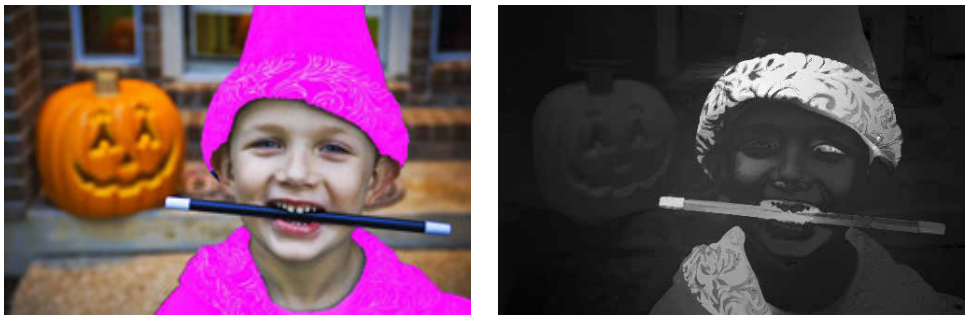
TABLE 61
User study. We show the percentages when our method and the competitors have been chosen by the participants.

	Ours	AAD	BDS	Cropping	MultiOp	PBW	Shift-Map
Figure 63	30.91%	16.36%	0.00%	**38.18%**	29.09%	10.91%	32.73%

(a) Original Image (b) Ours (c) AAD [6]

(d) BDS [7] (e) Cropping (f) MultiOp [10]

(g) PBW [8] (h) Shift-Map [9]

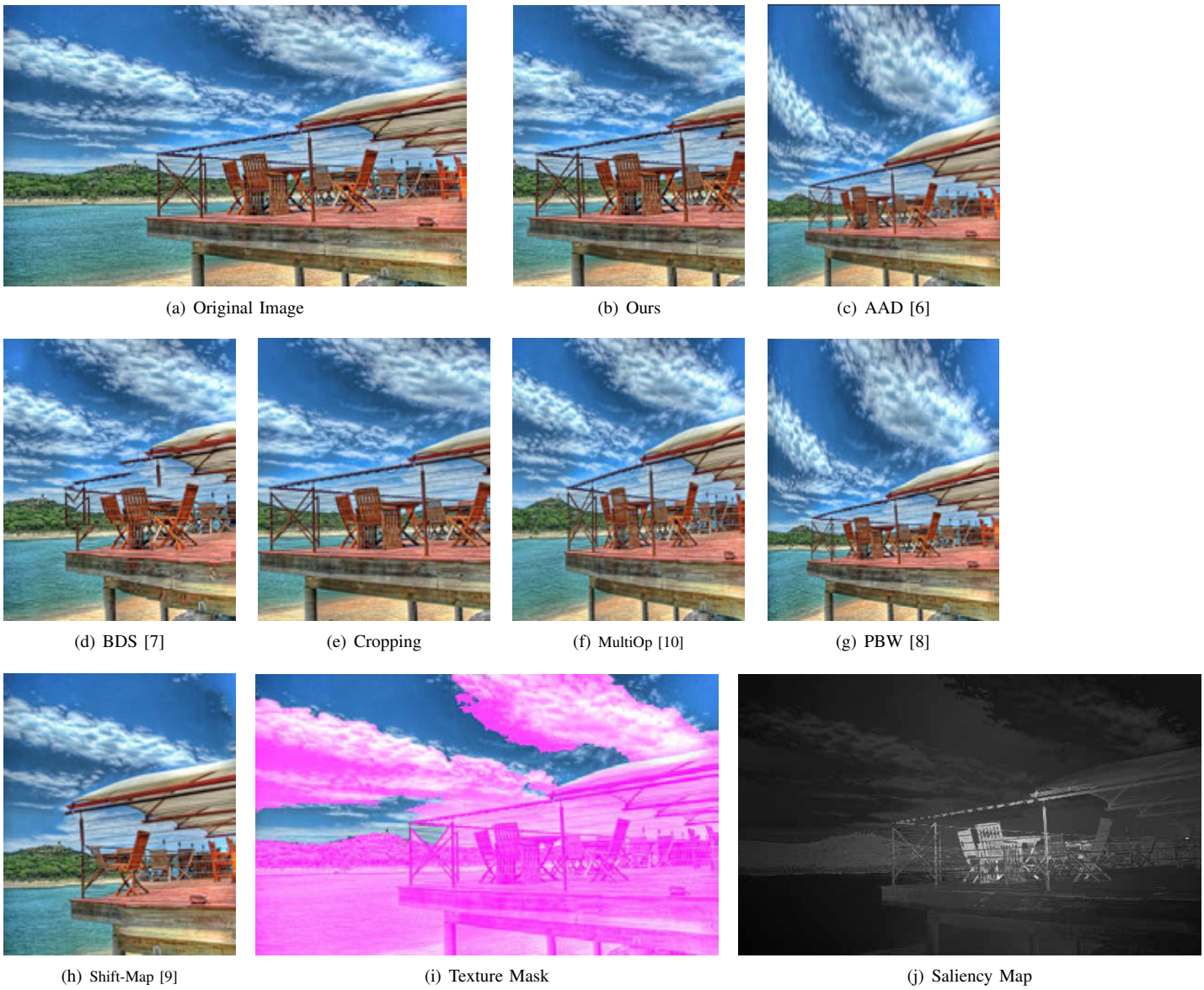


(i) Texture Mask (j) Saliency Map

Fig. 64. Input resolution is 500×332, output resolution is 375×332.

TABLE 62
User study. We show the percentages when our method and the competitors have been chosen by the participants.

	Ours	AAD	BDS	Cropping	MultiOp	PBW	Shift-Map
Figure 64	**45.45%**	32.73%	0.00%	9.09%	25.45%	34.55%	38.18%



(a) Original Image (b) Ours (c) AAD [6]

(d) BDS [7] (e) Cropping (f) MultiOp [10] (g) PBW [8]

(h) Shift-Map [9] (i) Texture Mask (j) Saliency Map

Fig. 65. Input resolution is 500×304, output resolution is 250×304.

TABLE 63
User study. We show the percentages when our method and the competitors have been chosen by the participants.

	Ours	AAD	BDS	Cropping	MultiOp	PBW	Shift-Map
Figure 65	**83.64**%	23.64%	0.00%	34.55%	20.00%	27.27%	1.82%

(a) Original Image

(b) Ours

(c) AAD [6]

(d) BDS [7]

(e) Cropping

(f) MultiOp [10]

(g) PBW [8]

(h) Shift-Map [9]

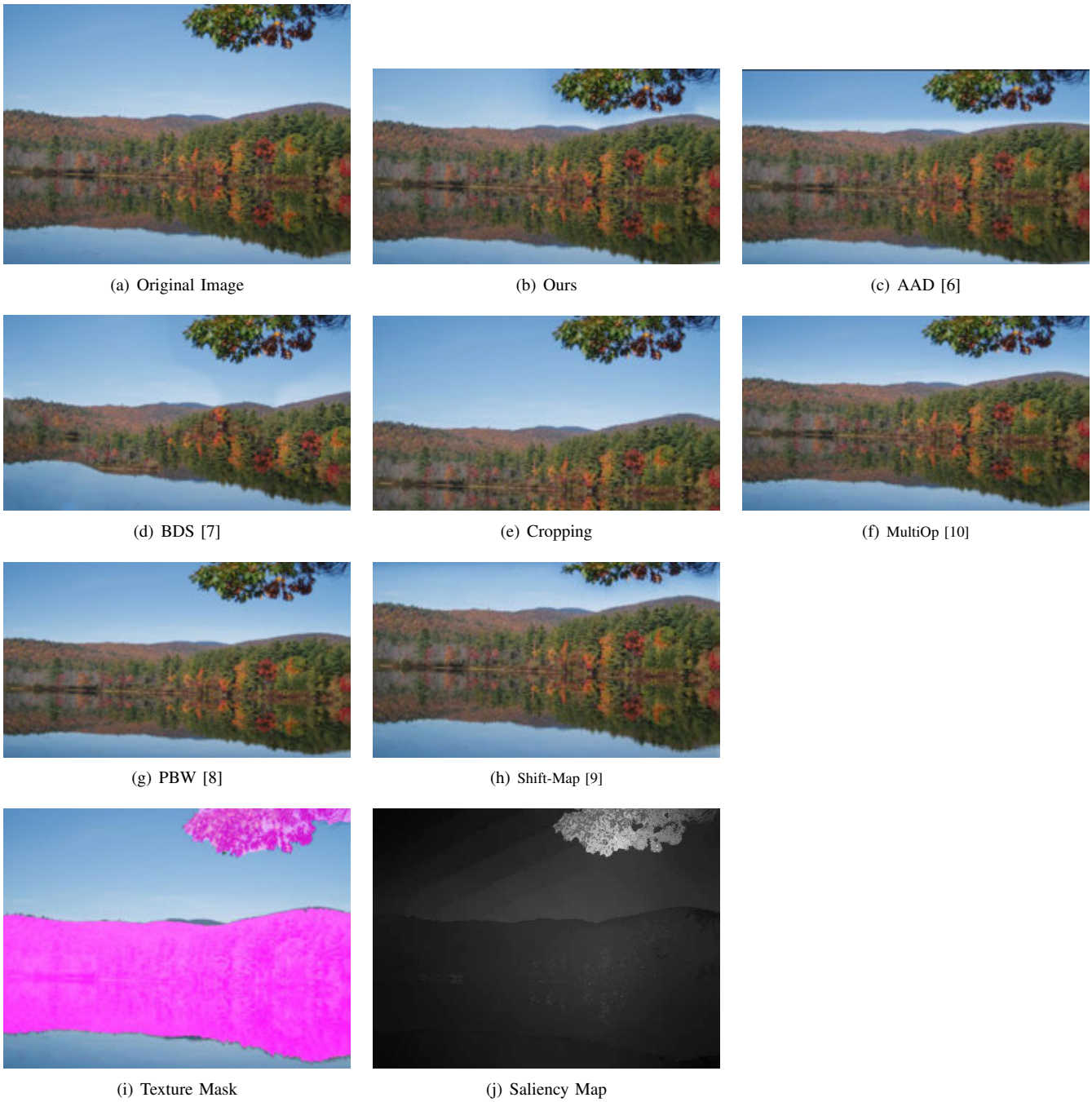
(i) Texture Mask

(j) Saliency Map

Fig. 66. Input resolution is 500×313, output resolution is 250×313.

TABLE 64
User study. We show the percentages when our method and the competitors have been chosen by the participants.

	Ours	AAD	BDS	Cropping	MultiOp	PBW	Shift-Map
Figure 66	**78.18%**	5.45%	0.00%	38.18%	21.82%	5.45%	43.64%



(a) Original Image (b) Ours (c) AAD [6]

(d) BDS [7] (e) Cropping (f) MultiOp [10]

(g) PBW [8] (h) Shift-Map [9]

(i) Texture Mask (j) Saliency Map

Fig. 67. Input resolution is 480×360, output resolution is 480×270.

TABLE 65
User study. We show the percentages when our method and the competitors have been chosen by the participants.

	Ours	AAD	BDS	Cropping	MultiOp	PBW	Shift-Map
Figure 67	34.55%	34.55%	0.00%	0.00%	32.73%	**36.36%**	23.64%

(a) Original Image (b) Ours (c) AAD [6]

(d) BDS [7] (e) Cropping (f) MultiOp [10]

(g) PBW [8] (h) Shift-Map [9]

(i) Texture Mask (j) Saliency Map

Fig. 68. Input resolution is 480×360, output resolution is 360×360.

TABLE 66
User study. We show the percentages when our method and the competitors have been chosen by the participants.

	Ours	AAD	BDS	Cropping	MultiOp	PBW	Shift-Map
Figure 68	40.00%	**50.91%**	0.00%	34.55%	5.45%	3.64%	9.09%

(a) Original Image

(b) Ours

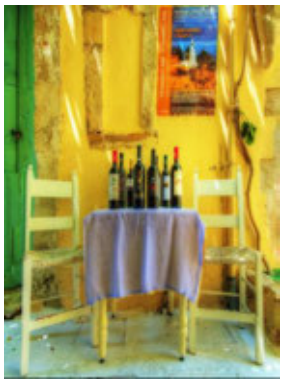
(c) AAD [6]

(d) BDS [7]

(e) Cropping

(f) MultiOp [10]

(g) PBW [8]



(h) Shift-Map [9]

(i) Texture Mask

(j) Saliency Map

Fig. 69. Input resolution is 500×340, output resolution is 250×340.

TABLE 67
User study. We show the percentages when our method and the competitors have been chosen by the participants.

	Ours	AAD	BDS	Cropping	MultiOp	PBW	Shift-Map
Figure 69	20.00%	20.00%	0.00%	12.73%	21.82%	29.09%	**38.18%**

(a) Original Image (b) Ours (c) AAD [6]

(d) BDS [7] (e) Cropping (f) MultiOp [10]

(g) PBW [8] (h) Shift-Map [9]

(i) Texture Mask (j) Saliency Map

Fig. 70. Input resolution is 480×360, output resolution is 480×270.

TABLE 68
User study. We show the percentages when our method and the competitors have been chosen by the participants.

	Ours	AAD	BDS	Cropping	MultiOp	PBW	Shift-Map
Figure 70	**32.73**%	27.27%	0.00%	29.09%	25.45%	21.82%	25.45%

(a) Original Image

(b) Ours

(c) AAD [6]

(d) BDS [7]

(e) Cropping

(f) MultiOp [10]

(g) PBW [8]

(h) Shift-Map [9]

(i) Texture Mask

(j) Saliency Map

Fig. 71. Input resolution is 500×333, output resolution is 250×333.

TABLE 69
User study. We show the percentages when our method and the competitors have been chosen by the participants.

	Ours	AAD	BDS	Cropping	MultiOp	PBW	Shift-Map
Figure 71	**43.64%**	10.91%	0.00%	25.45%	14.55%	9.09%	34.55%

(a) Original Image

(b) Ours

(c) AAD [6]

(d) BDS [7]

(e) Cropping

(f) MultiOp [10]

(g) PBW [8]

(h) Shift-Map [9]

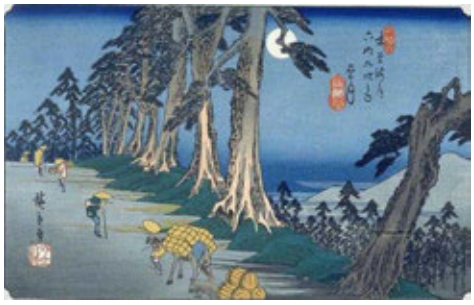
(i) Texture Mask

(j) Saliency Map

Fig. 72. Input resolution is 500×344, output resolution is 375×344.

TABLE 70
User study. We show the percentages when our method and the competitors have been chosen by the participants.

	Ours	AAD	BDS	Cropping	MultiOp	PBW	Shift-Map
Figure 72	**25.45%**	25.45%	21.82%	18.18%	23.64%	21.82%	20.00%



(a) Original Image

(b) Ours

(c) AAD [6]

(d) BDS [7]

(e) Cropping

(f) MultiOp [10]

(g) PBW [8]

(h) Shift-Map [9]

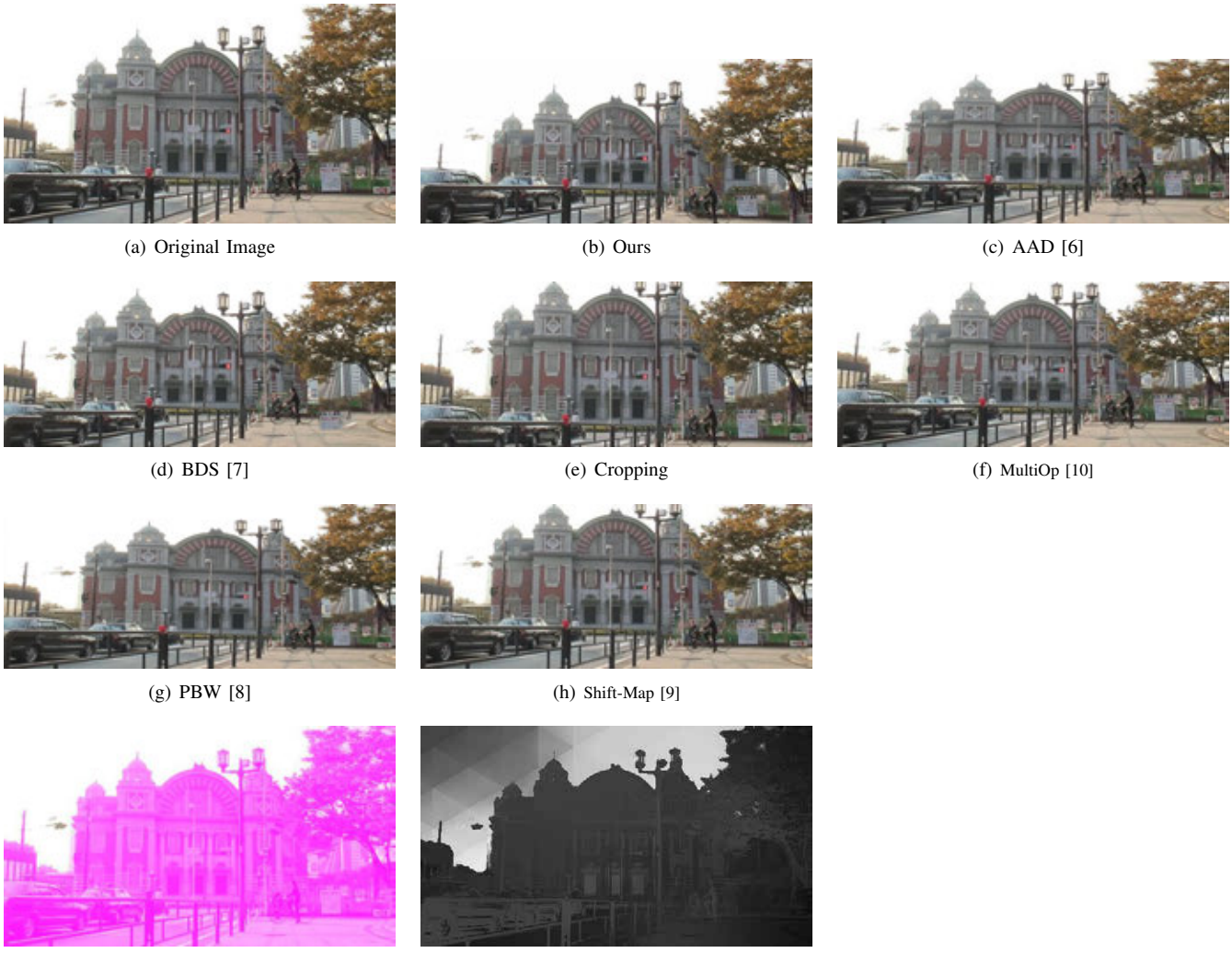
(i) Texture Mask

(j) Saliency Map

Fig. 73. Input resolution is 500×316, output resolution is 375×316.

TABLE 71
User study. We show the percentages when our method and the competitors have been chosen by the participants.

	Ours	AAD	BDS	Cropping	MultiOp	PBW	Shift-Map
Figure 73	23.64%	27.27%	0.00%	20.00%	25.45%	**29.09%**	25.45%



(a) Original Image (b) Ours (c) AAD [6]

(d) BDS [7] (e) Cropping (f) MultiOp [10]

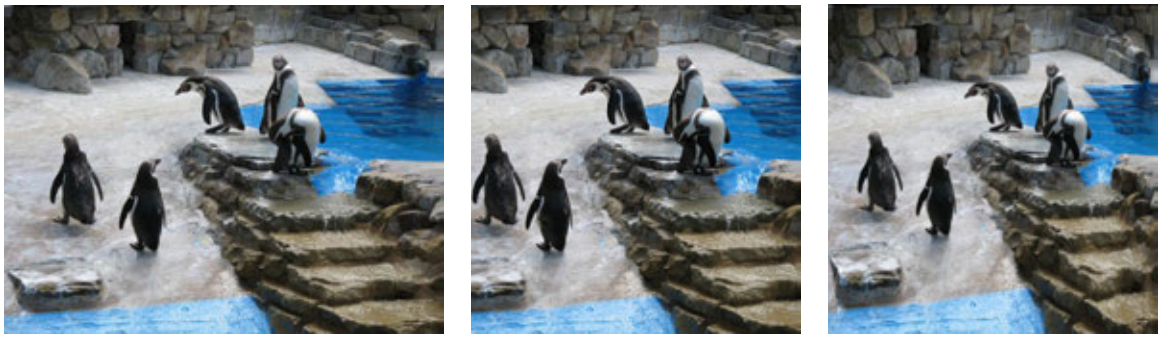
(g) PBW [8] (h) Shift-Map [9]

(i) Texture Mask (j) Saliency Map

Fig. 74. Input resolution is 500×281, output resolution is 500×210.

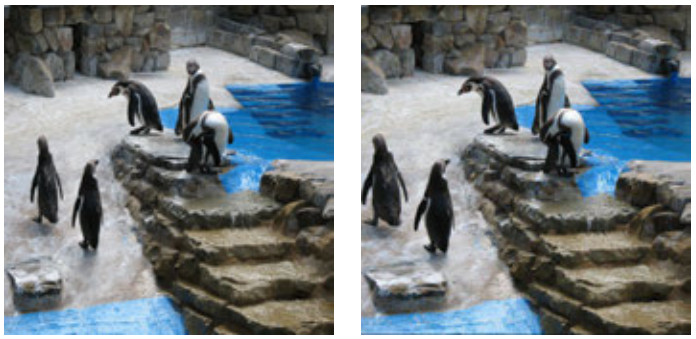
TABLE 72
User study. We show the percentages when our method and the competitors have been chosen by the participants.

	Ours	AAD	BDS	Cropping	MultiOp	PBW	Shift-Map
Figure 74	27.27%	**29.09%**	0.00%	21.82%	27.27%	25.45%	23.64%



(a) Original Image (b) Ours (c) AAD [6]

(d) BDS [7] (e) Cropping (f) MultiOp [10]



(g) PBW [8] (h) Shift-Map [9]

(i) Texture Mask (j) Saliency Map

Fig. 75. Input resolution is 500×374, output resolution is 375×374.

TABLE 73
User study. We show the percentages when our method and the competitors have been chosen by the participants.

	Ours	AAD	BDS	Cropping	MultiOp	PBW	Shift-Map
Figure 75	**41.82%**	40.00%	34.55%	36.36%	5.45%	7.27%	14.55%

(a) Original Image (b) Ours (c) AAD [6]

(d) BDS [7] (e) Cropping (f) MultiOp [10]

(g) PBW [8] (h) Shift-Map [9]

(i) Texture Mask (j) Saliency Map

Fig. 76. Input resolution is 500×351, output resolution is 375×351.

TABLE 74
User study. We show the percentages when our method and the competitors have been chosen by the participants.

	Ours	AAD	BDS	Cropping	MultiOp	PBW	Shift-Map
Figure 76	**41.82%**	27.27%	0.00%	29.09%	10.91%	27.27%	41.82%

(a) Original Image

(b) Ours

(c) AAD [6]

(d) BDS [7]

(e) Cropping

(f) MultiOp [10]

(g) PBW [8]

(h) Shift-Map [9]

(i) Texture Mask

(j) Saliency Map

Fig. 77. Input resolution is 500×333, output resolution is 250×333.

TABLE 75
User study. We show the percentages when our method and the competitors have been chosen by the participants.

	Ours	AAD	BDS	Cropping	MultiOp	PBW	Shift-Map
Figure 77	34.55%	**67.27%**	0.00%	25.45%	21.82%	27.27%	0.00%

(a) Original Image

(b) Ours

(c) AAD [6]

(d) BDS [7]

(e) Cropping

(f) MultiOp [10]

(g) PBW [8]

(h) Shift-Map [9]

(i) Texture Mask

(j) Saliency Map

Fig. 78. Input resolution is 500×329, output resolution is 250×329.

TABLE 76
User study. We show the percentages when our method and the competitors have been chosen by the participants.

	Ours	AAD	BDS	Cropping	MultiOp	PBW	Shift-Map
Figure 78	**85.45%**	7.27%	43.64%	20.00%	5.45%	0.00%	0.00%

(a) Original Image

(b) Ours

(c) AAD [6]

(d) BDS [7]

(e) Cropping

(f) MultiOp [10]

(g) PBW [8]

(h) Shift-Map [9]

(i) Texture Mask

(j) Saliency Map

Fig. 79. Input resolution is 500×334, output resolution is 375×334.

TABLE 77
User study. We show the percentages when our method and the competitors have been chosen by the participants.

	Ours	AAD	BDS	Cropping	MultiOp	PBW	Shift-Map
Figure 79	32.73%	32.73%	0.00%	29.09%	30.91%	**34.55%**	29.09%

(a) Original Image

(b) Ours

(c) AAD [6]

(d) BDS [7]

(e) Cropping

(f) MultiOp [10]

(g) PBW [8]

(h) Shift-Map [9]

(i) Texture Mask

(j) Saliency Map

Fig. 80. Input resolution is 500×332, output resolution is 250×332.

TABLE 78
User study. We show the percentages when our method and the competitors have been chosen by the participants.

	Ours	AAD	BDS	Cropping	MultiOp	PBW	Shift-Map
Figure 80	**52.73**%	16.36%	0.00%	20.00%	34.55%	29.09%	23.64%

(a) Original Image

(b) Ours

(c) AAD [6]

(d) BDS [7]

(e) Cropping

(f) MultiOp [10]

(g) PBW [8]

(h) Shift-Map [9]

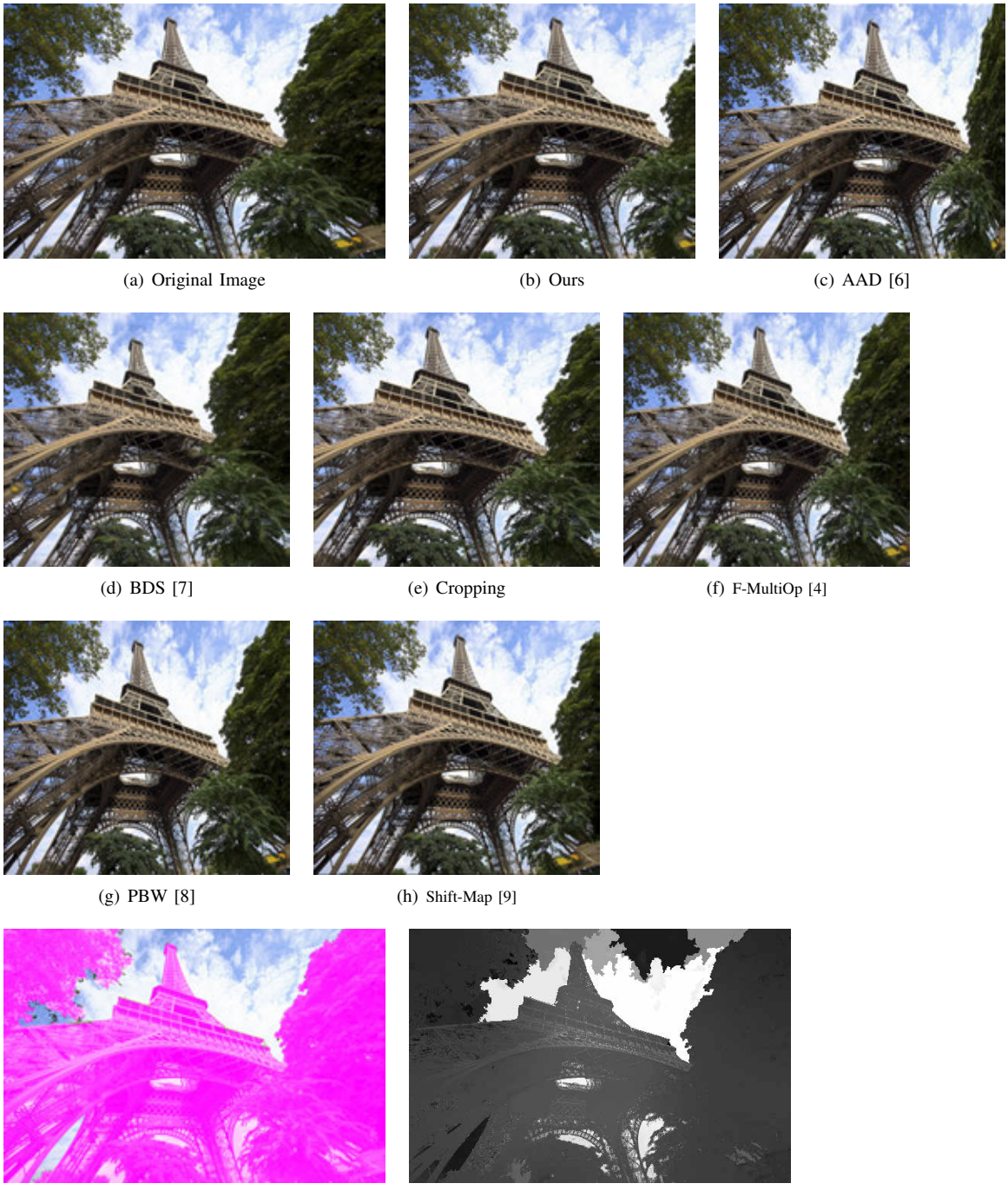
(i) Texture Mask

(j) Saliency Map

Fig. 81. Input resolution is 500×334, output resolution is 375×334.

TABLE 79
User study. We show the percentages when our method and the competitors have been chosen by the participants.

	Ours	AAD	BDS	Cropping	F-MultiOp	PBW	Shift-Map
Figure 81	**29.09%**	29.09%	27.27%	23.64%	16.36%	12.73%	21.82%



(a) Original Image (b) Ours (c) AAD [6]

(d) BDS [7] (e) Cropping (f) F-MultiOp [4]

(g) PBW [8] (h) Shift-Map [9]

(i) Texture Mask (j) Saliency Map

Fig. 82. Input resolution is 500×333, output resolution is 375×333.

TABLE 80
User study. We show the percentages when our method and the competitors have been chosen by the participants.

	Ours	AAD	BDS	Cropping	F-MultiOp	PBW	Shift-Map
Figure 82	**40.00**%	16.36%	0.00%	20.00%	21.82%	25.45%	43.64%

(a) Original Image

(b) Ours

(c) AAD [6]

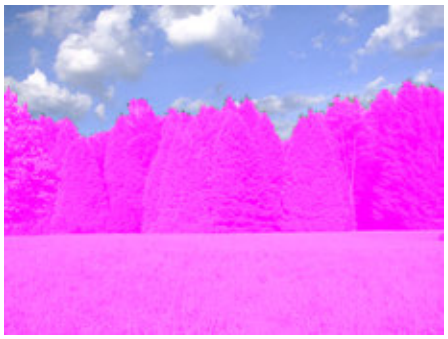
(d) BDS [7]

(e) Cropping

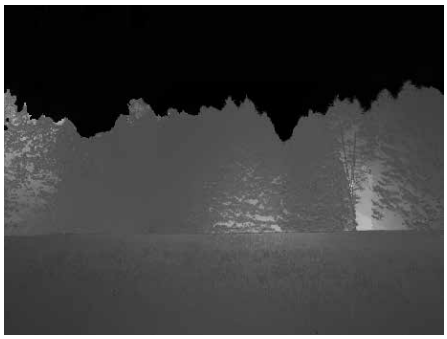
(f) F-MultiOp [4]

(g) PBW [8]

(h) Shift-Map [9]



(i) Texture Mask

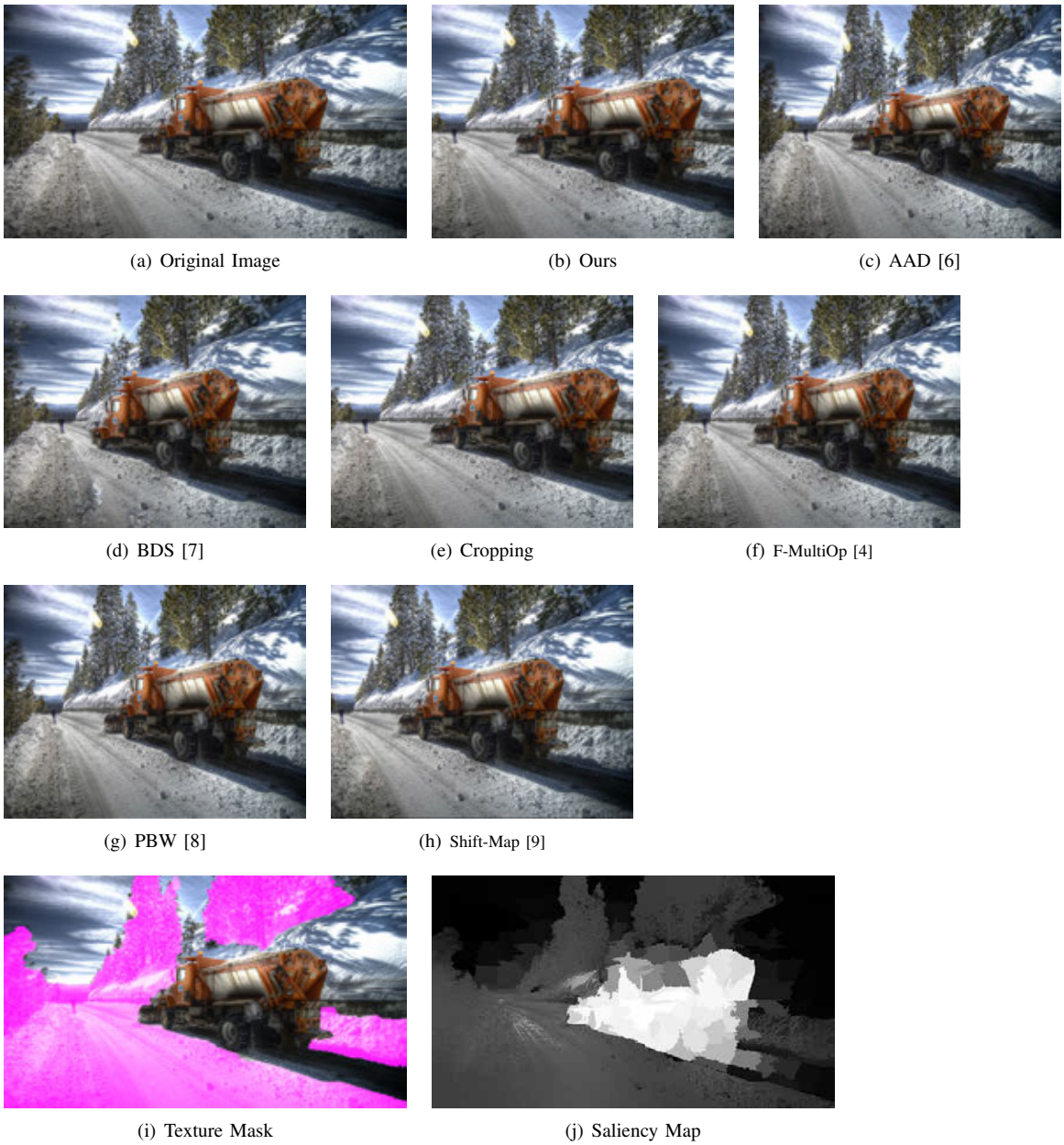


(j) Saliency Map

Fig. 83. Input resolution is 460×345, output resolution is 345×345.

TABLE 81
User study. We show the percentages when our method and the competitors have been chosen by the participants.

	Ours	AAD	BDS	Cropping	F-MultiOp	PBW	Shift-Map
Figure 83	**45.45%**	9.09%	18.18%	23.64%	29.09%	5.45%	41.82%



(a) Original Image (b) Ours (c) AAD [6]

(d) BDS [7] (e) Cropping (f) F-MultiOp [4]

(g) PBW [8] (h) Shift-Map [9]

(i) Texture Mask (j) Saliency Map

Fig. 84. Input resolution is 540×312, output resolution is 405×312.

TABLE 82
User study. We show the percentages when our method and the competitors have been chosen by the participants.

	Ours	AAD	BDS	Cropping	F-MultiOp	PBW	Shift-Map
Figure 84	**27.27**%	36.36%	3.64%	18.18%	21.82%	30.91%	12.73%

(a) Original Image

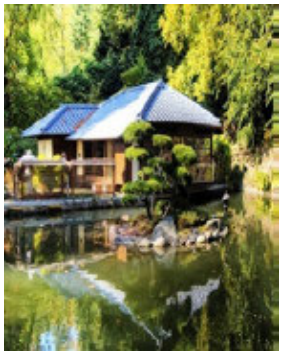
(b) Ours

(c) AAD [6]

(d) BDS [7]

(e) Cropping

(f) MultiOp [10]



(g) PBW [8]

(h) Shift-Map [9]

(i) Texture Mask

(j) Saliency Map

Fig. 85. Input resolution is 512×323, output resolution is 256×323.

TABLE 83
User study. We show the percentages when our method and the competitors have been chosen by the participants.

	Ours	AAD	BDS	Cropping	F-MultiOp	PBW	Shift-Map
Figure 85	**36.36%**	18.18%	23.64%	18.18%	12.73%	16.36%	18.18%

(a) Original Image (b) Ours (c) AAD [6]

(d) BDS [7] (e) Cropping (f) MultiOp [10]

(g) PBW [8] (h) Shift-Map [9]

(i) Texture Mask (j) Saliency Map

Fig. 86. Input resolution is 500×367, output resolution is 375×367.

TABLE 84
User study. We show the percentages when our method and the competitors have been chosen by the participants.

	Ours	AAD	BDS	Cropping	F-MultiOp	PBW	Shift-Map
Figure 86	**32.73**%	29.09%	0.00%	34.55%	18.18%	9.09%	21.82%

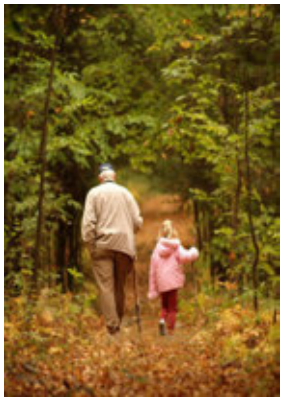
(a) Original Image

(b) Ours

(c) AAD [6]

(d) BDS [7]

(e) Cropping



(f) MultiOp [10]

(g) PBW [8]

(h) Shift-Map [9]

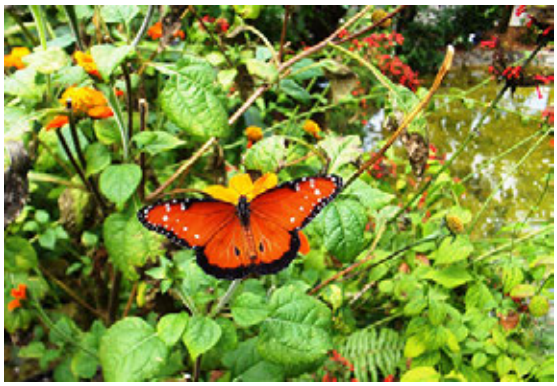
(i) Texture Mask

(j) Saliency Map

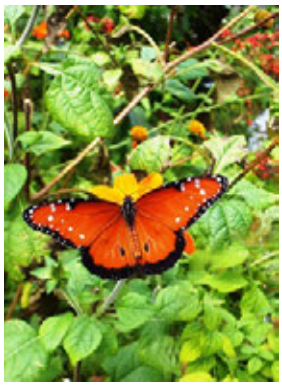
Fig. 87. Input resolution is 600×429, output resolution is 300×429.

TABLE 85
User study. We show the percentages when our method and the competitors have been chosen by the participants.

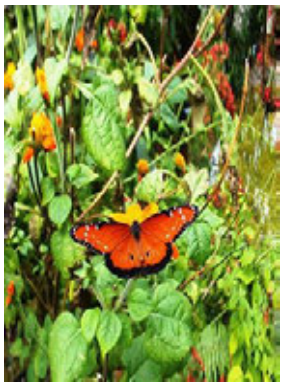
	Ours	AAD	BDS	Cropping	F-MultiOp	PBW	Shift-Map
Figure 87	**21.82**%	14.55%	23.64%	43.64%	20.00%	3.64%	7.27%



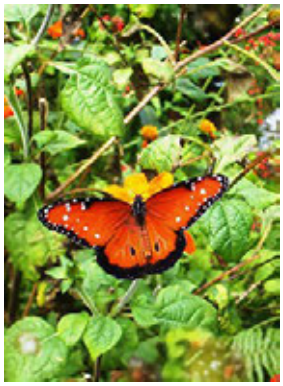
(a) Original Image



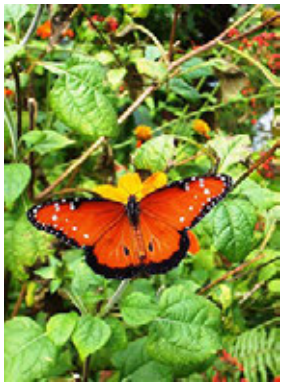
(b) Ours



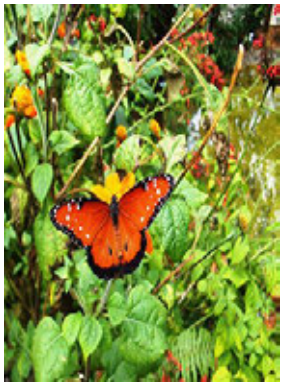
(c) AAD [6]



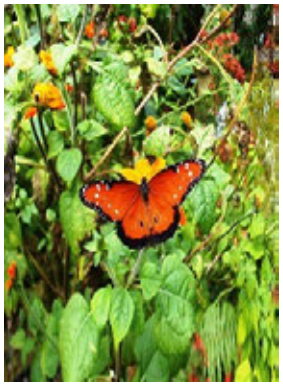
(d) BDS [7]



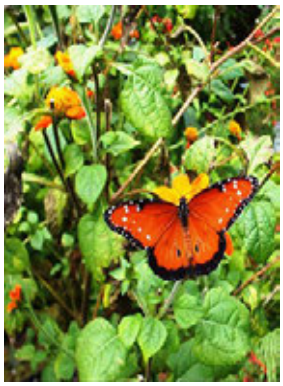
(e) Cropping



(f) MultiOp [10]



(g) PBW [8]



(h) Shift-Map [9]

(i) Texture Mask

(j) Saliency Map

Fig. 88. Input resolution is 500×343, output resolution is 250×343.

TABLE 86
User study. We show the percentages when our method and the competitors have been chosen by the participants.

	Ours	AAD	BDS	Cropping	F-MultiOp	PBW	Shift-Map
Figure 88	**49.09%**	7.27%	36.36%	50.91%	7.27%	0.00%	5.45%

(a) Original Image

(b) Ours

(c) AAD [6]

(d) BDS [7]

(e) F-MultiOp [4]

(f) Shift-Map [9]

Fig. 89. Input resolution is 500×333, output resolution is 750×332. Our method well preserve the DPI of the T-regions in the result, as well as the texel shape and the globally visual effect of T-regions. The quality of the T-regions in AAD and F-MultiOp results are reduced by up-sampling while there are also obvious texel shape distortion. There are over-smoothing areas in BDS result. There is repeat-copying artifact in shift-map result.

(a) Original Image

(b) Ours

(c) AAD [6]

(d) BDS [7]

(e) F-MultiOp [4]

Fig. 90. Input resolution is 500×375, output resolution is 640×375. Our method well preserve the DPI of the T-regions in the result, as well as the texel shape and the globally visual effect of T-regions. The quality of the T-regions in AAD and F-MultiOp results are reduced by up-sampling while there are also obvious texel shape distortion. There are over-smoothing areas in BDS result.

(a) Original Image

(b) Ours

(c) AAD [6]

(d) BDS [7]

(e) F-MultiOp [4]

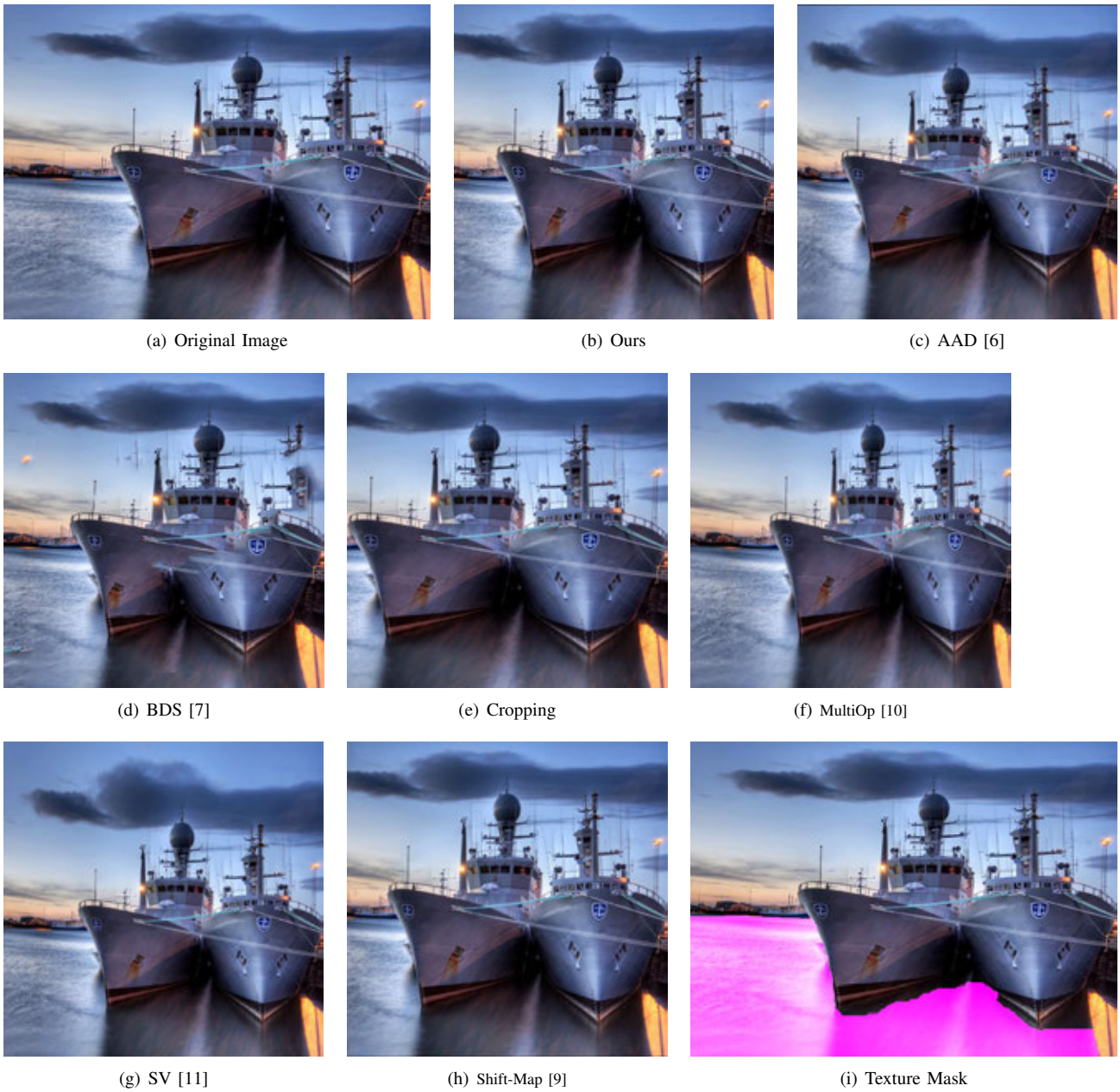
Fig. 91. Input resolution is 500×375, output resolution is 750×375. Our method well preserve the DPI of the T-regions in the result, as well as the texel shape and the globally visual effect of T-regions. The quality of the T-regions in AAD and F-MultiOp results are reduced by up-sampling while there are also obvious texel shape distortion. There are over-smoothing areas in BDS result.

(a) Original Image (b) Ours (c) AAD [6]

(d) BDS [7] (e) Cropping (f) MultiOp [10]

(g) SV [11] (h) Shift-Map [9] (i) Texture Mask

Fig. 92. Input resolution is 500×396, output resolution is 375×396.



(a) Original Image (b) Ours (c) AAD [6]

(d) BDS [7] (e) Cropping (f) MultiOp [10]

(g) SV [11] (h) Shift-Map [9] (i) Texture Mask

Fig. 93. Input resolution is 500×369, output resolution is 375×369.

(a) Original Image

(b) Ours

(c) AAD [6]

(d) BDS [7]

(e) Cropping

(f) MultiOp [10]

(g) SV [11]

(h) Shift-Map [9]

(i) Texture Mask

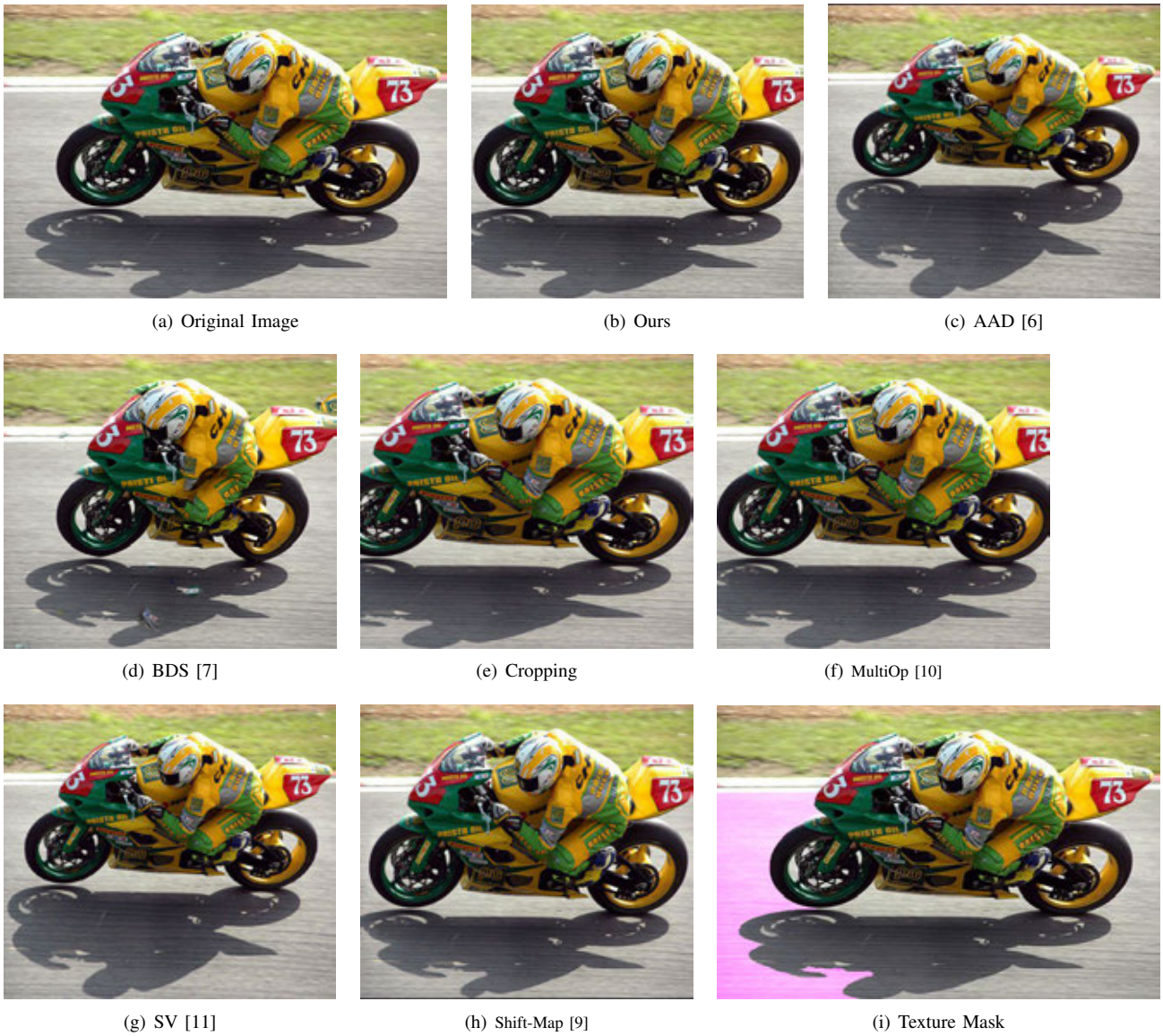
Fig. 94. Input resolution is 500×332, output resolution is 375×332.

(a) Original Image (b) Ours (c) AAD [6]

(d) BDS [7] (e) Cropping (f) MultiOp [10]

(g) SV [11] (h) Shift-Map [9] (i) Texture Mask

Fig. 95. Input resolution is 500×374, output resolution is 375×374.



(a) Original Image (b) Ours (c) AAD [6]

(d) BDS [7] (e) Cropping (f) MultiOp [10]

(g) SV [11] (h) Shift-Map [9] (i) Texture Mask

Fig. 96. Input resolution is 500×332, output resolution is 375×332.

(a) Original Image (b) Ours (c) AAD [6]

(d) BDS [7] (e) Cropping (f) MultiOp [10]

(g) SV [11] (h) Shift-Map [9] (i) Texture Mask

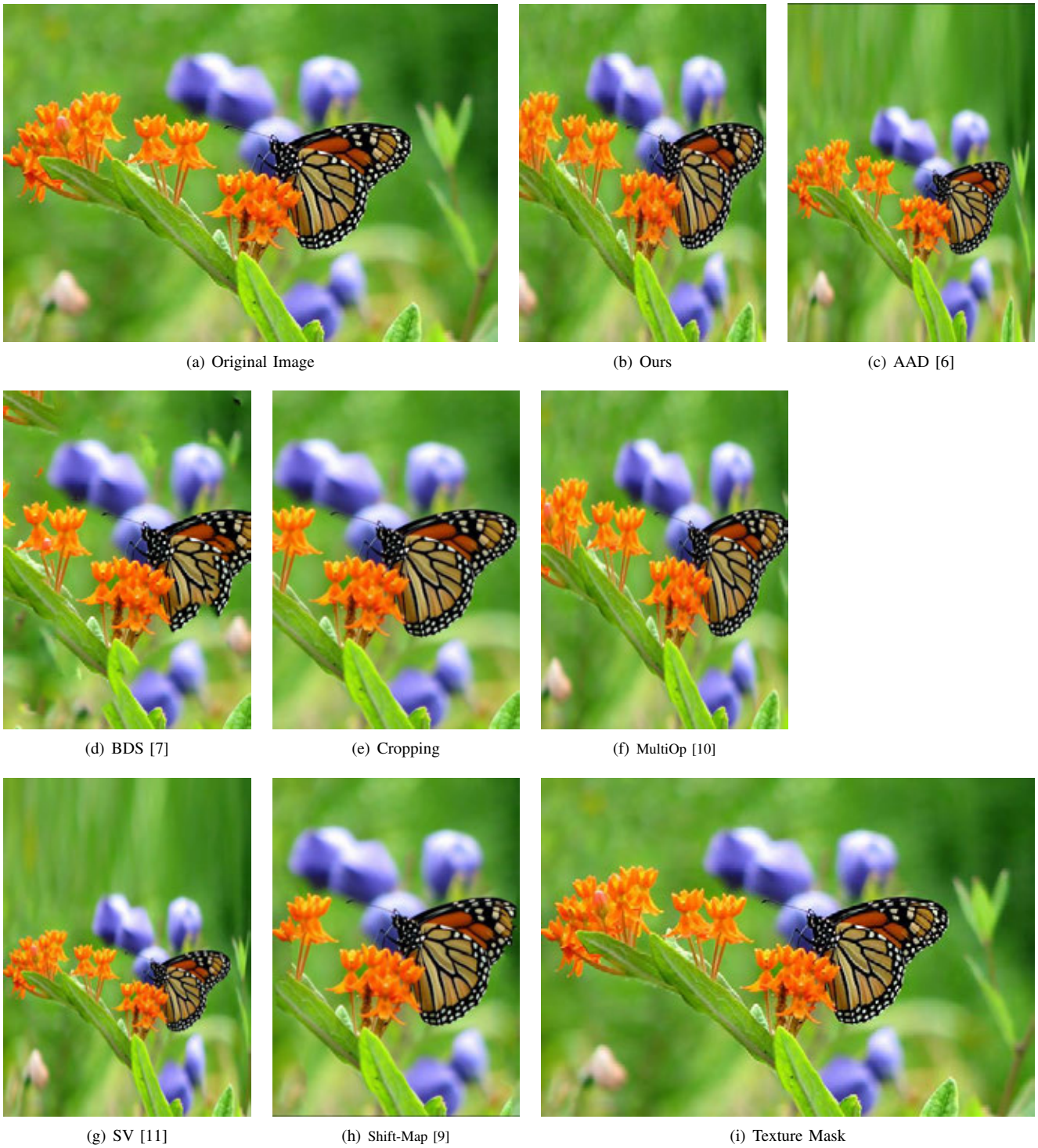
Fig. 97. Input resolution is 500×303, output resolution is 250×303.

(a) Original Image (b) Ours (c) AAD [6]

(d) BDS [7] (e) Cropping (f) MultiOp [10]

(g) SV [11] (h) Shift-Map [9] (i) Texture Mask

Fig. 98. Input resolution is 500×375, output resolution is 375×375.



(a) Original Image (b) Ours (c) AAD [6]

(d) BDS [7] (e) Cropping (f) MultiOp [10]

(g) SV [11] (h) Shift-Map [9] (i) Texture Mask

Fig. 99. Input resolution is 500×341, output resolution is 250×341.

(a) Original Image (b) Ours (c) AAD [6]

(d) BDS [7] (e) Cropping (f) MultiOp [10]

(g) SV [11] (h) Shift-Map [9] (i) Texture Mask

Fig. 100. Input resolution is 384×385, output resolution is 288×385.

(a) Original Image (b) Ours (c) AAD [6]

(d) BDS [7] (e) Cropping (f) MultiOp [10]

(g) SV [11] (h) Shift-Map [9] (i) Texture Mask

Fig. 101. Input resolution is 500×375, output resolution is 375×375.

(a) Original Image (b) Ours (c) AAD [6]

(d) BDS [7] (e) Cropping (f) MultiOp [10]

(g) SV [11] (h) Shift-Map [9] (i) Texture Mask

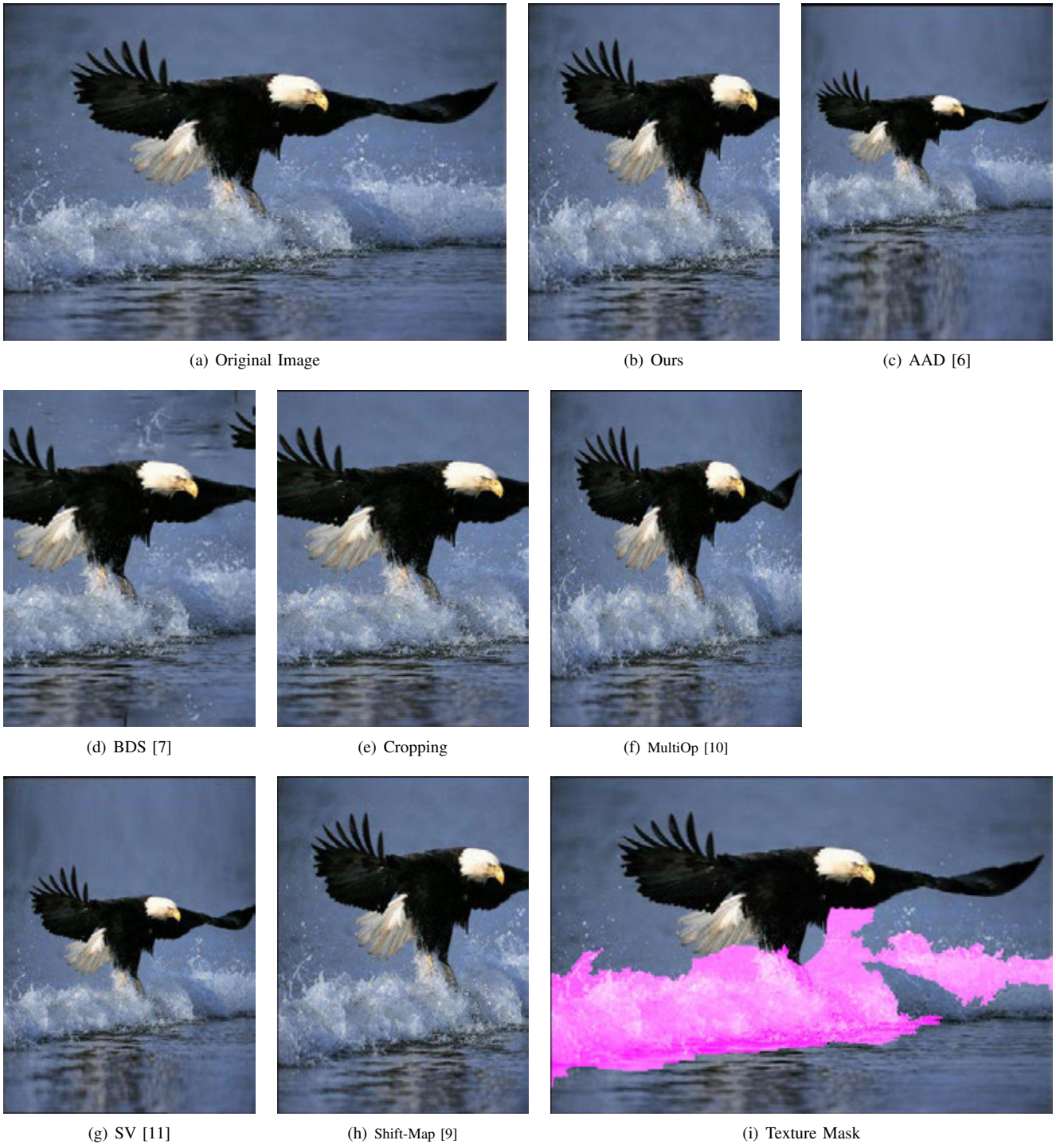
Fig. 102. Input resolution is 500×332, output resolution is 250×332.

(a) Original Image (b) Ours (c) AAD [6]

(d) BDS [7] (e) Cropping (f) MultiOp [10]

(g) SV [11] (h) Shift-Map [9] (i) Texture Mask

Fig. 103. Input resolution is 500×328, output resolution is 250×328.

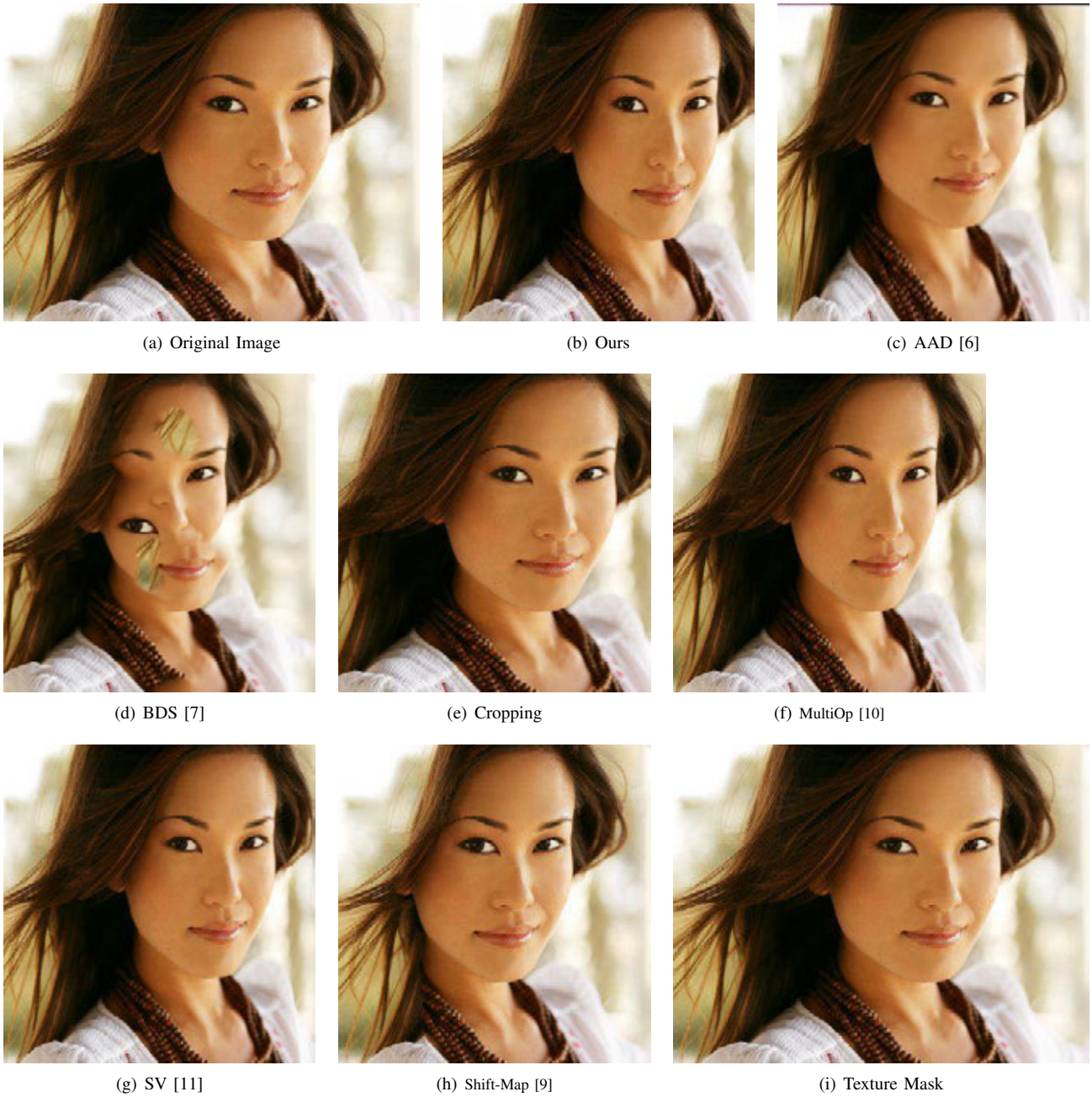


(a) Original Image (b) Ours (c) AAD [6]

(d) BDS [7] (e) Cropping (f) MultiOp [10]

(g) SV [11] (h) Shift-Map [9] (i) Texture Mask

Fig. 104. Input resolution is 500×335, output resolution is 250×335.

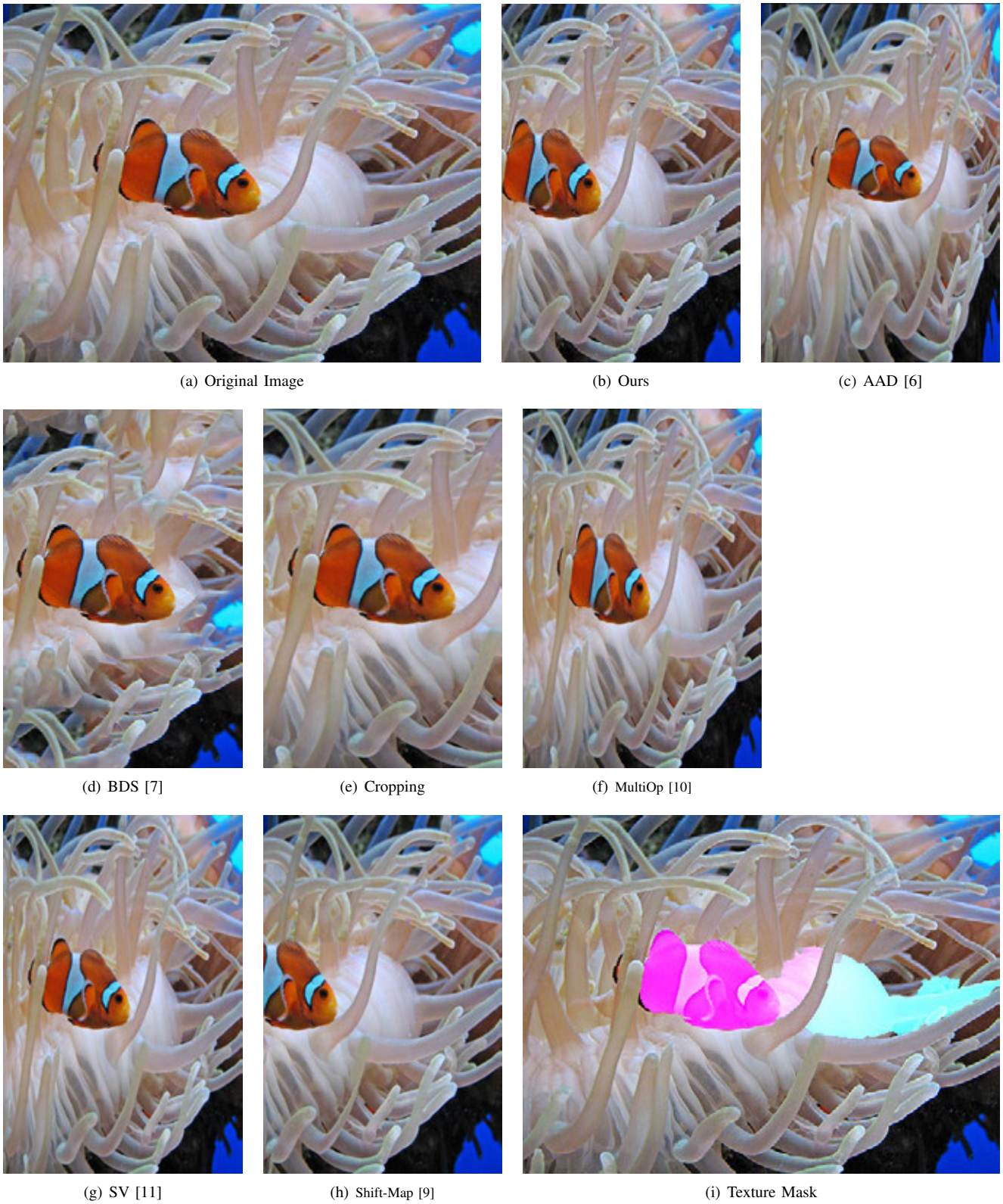


(a) Original Image (b) Ours (c) AAD [6]

(d) BDS [7] (e) Cropping (f) MultiOp [10]

(g) SV [11] (h) Shift-Map [9] (i) Texture Mask

Fig. 105. Input resolution is 392×300, output resolution is 294×300.

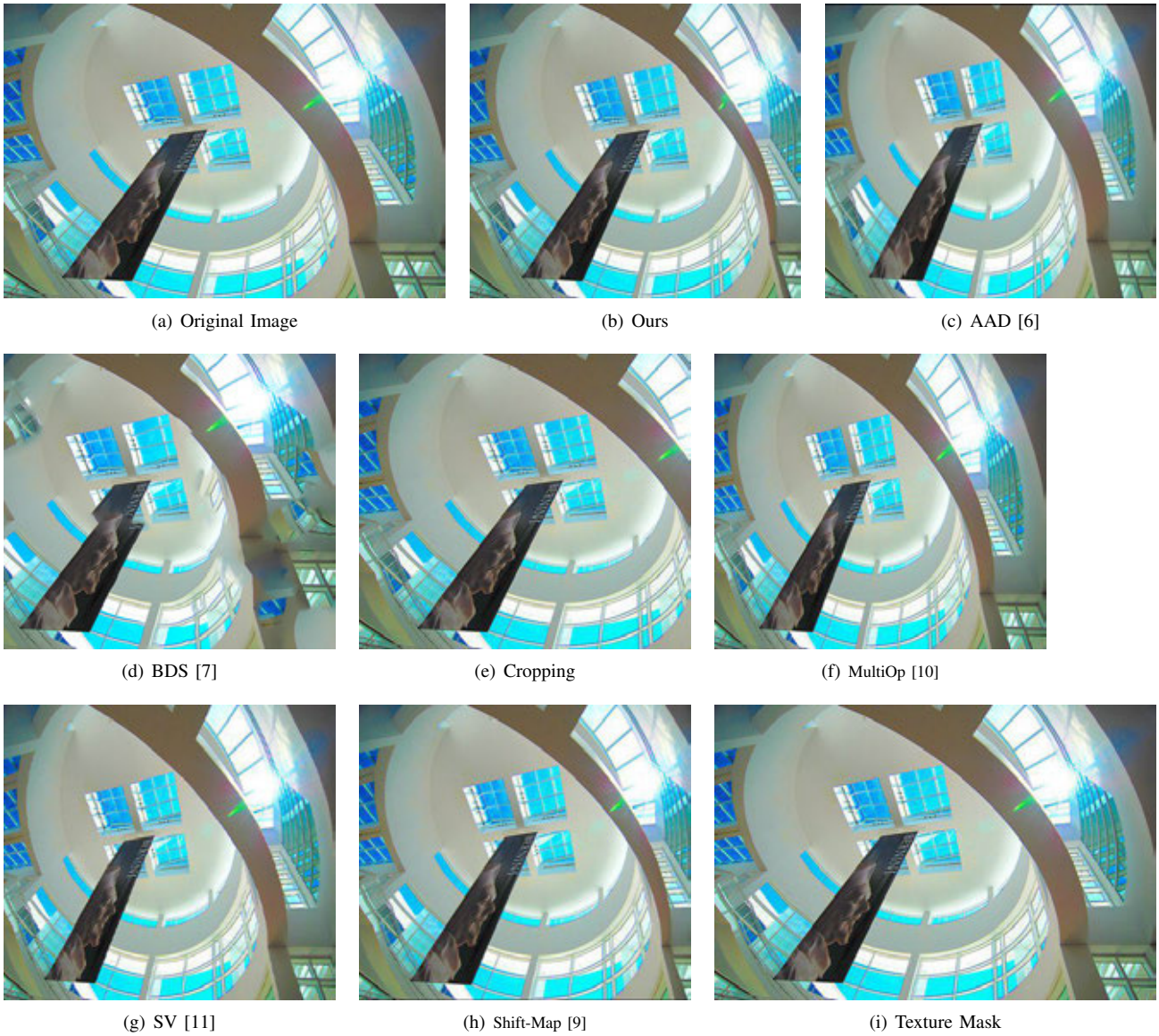


(a) Original Image (b) Ours (c) AAD [6]

(d) BDS [7] (e) Cropping (f) MultiOp [10]

(g) SV [11] (h) Shift-Map [9] (i) Texture Mask

Fig. 106. Input resolution is 500×375, output resolution is 250×375.



(a) Original Image (b) Ours (c) AAD [6]

(d) BDS [7] (e) Cropping (f) MultiOp [10]

(g) SV [11] (h) Shift-Map [9] (i) Texture Mask

Fig. 107. Input resolution is 500×334, output resolution is 375×334.

(a) Original Image (b) Ours (c) AAD [6]

(d) BDS [7] (e) Cropping (f) MultiOp [10]

(g) SV [11] (h) Shift-Map [9] (i) Texture Mask

Fig. 108. Input resolution is 500×395, output resolution is 250×395.

(a) Original Image

(b) Ours

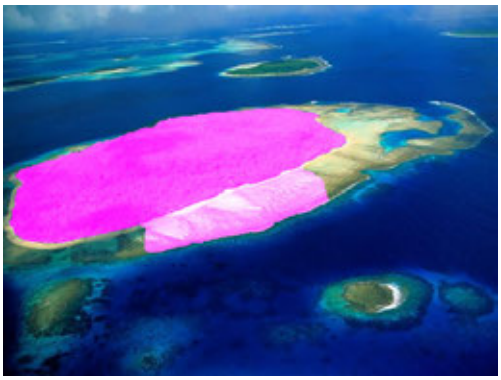
(c) AAD [6]

(d) BDS [7]

(e) MultiOp [10]

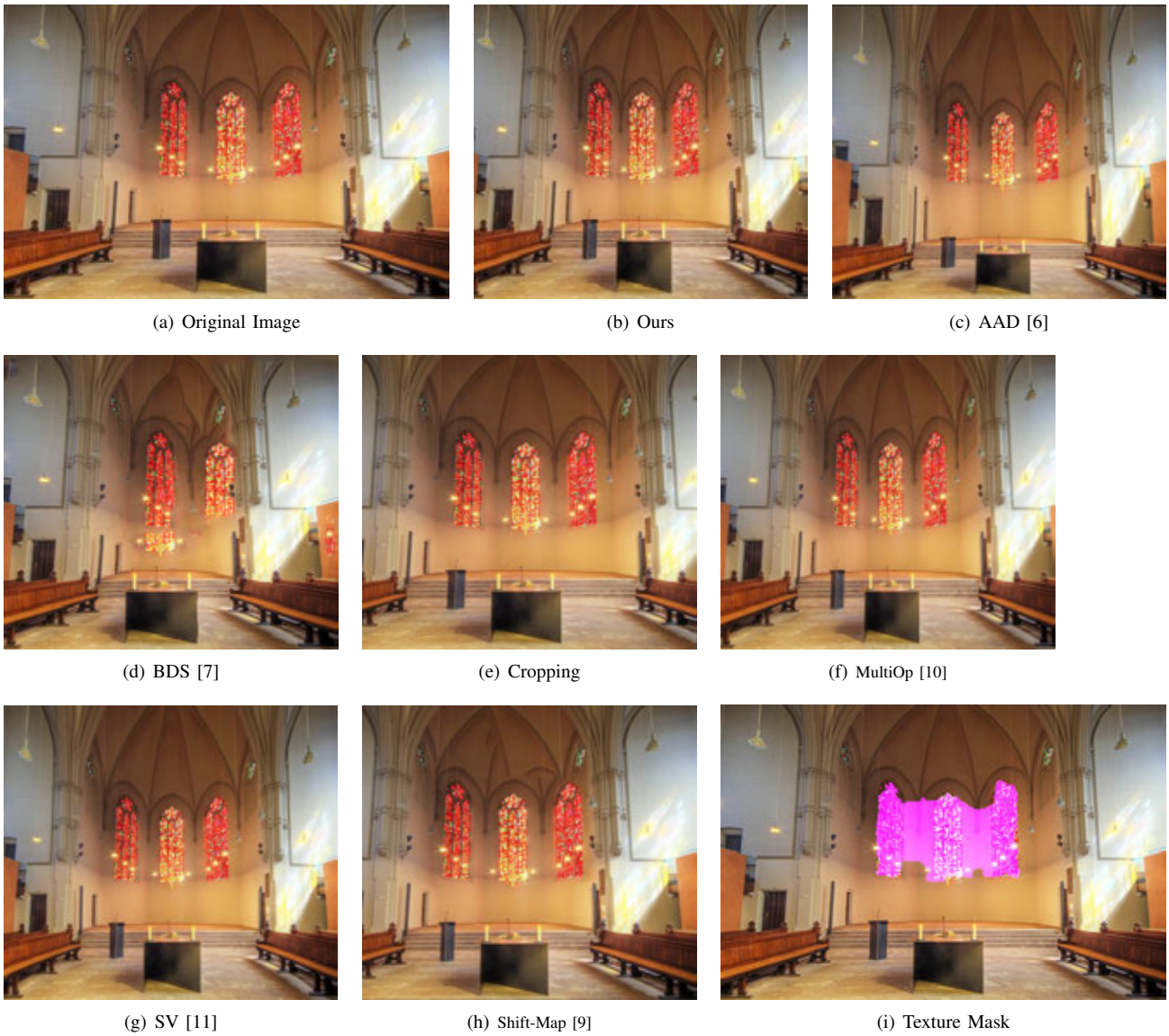
(f) SV [11]

(g) Shift-Map [9]



(h) Texture Mask

Fig. 109. Input resolution is 500×375, output resolution is 625×375.

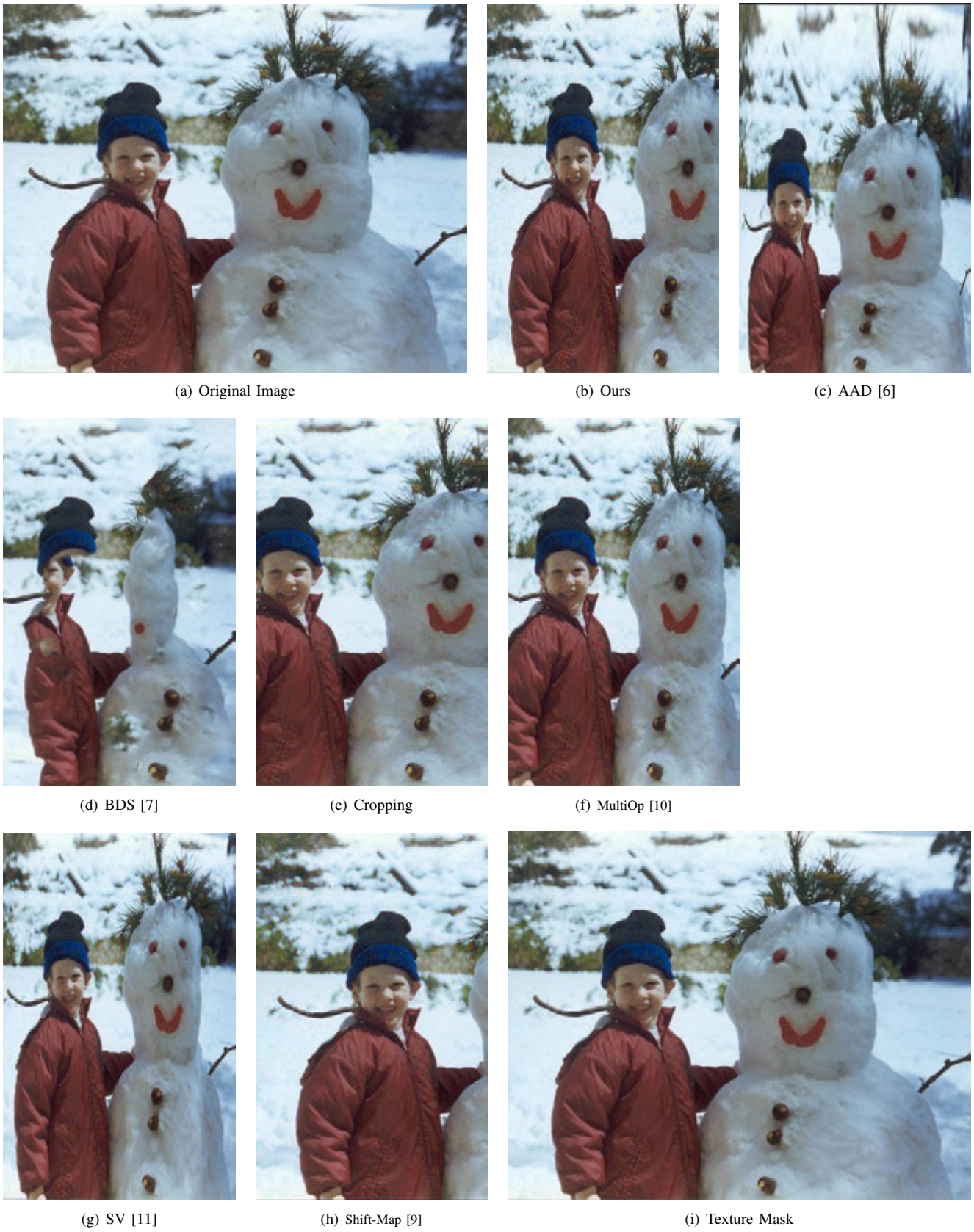


(a) Original Image (b) Ours (c) AAD [6]

(d) BDS [7] (e) Cropping (f) MultiOp [10]

(g) SV [11] (h) Shift-Map [9] (i) Texture Mask

Fig. 110. Input resolution is 500×330, output resolution is 375×330.



(a) Original Image (b) Ours (c) AAD [6]

(d) BDS [7] (e) Cropping (f) MultiOp [10]

(g) SV [11] (h) Shift-Map [9] (i) Texture Mask

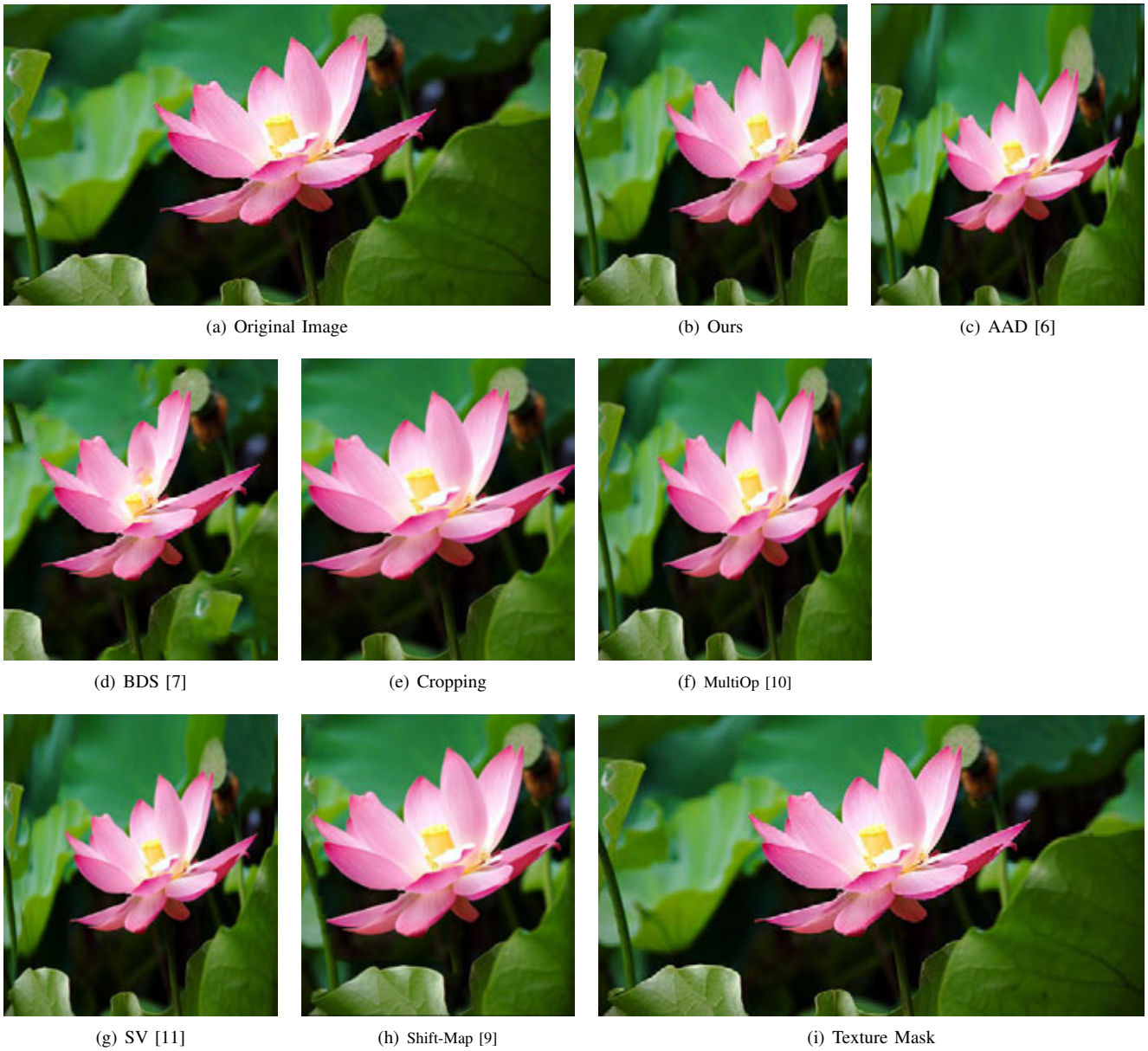
Fig. 111. Input resolution is 500×397, output resolution is 250×397.

(a) Original Image (b) Ours (c) AAD [6]

(d) BDS [7] (e) Cropping (f) MultiOp [10]

(g) SV [11] (h) Shift-Map [9] (i) Texture Mask

Fig. 112. Input resolution is 500×375, output resolution is 375×375.



(a) Original Image (b) Ours (c) AAD [6]

(d) BDS [7] (e) Cropping (f) MultiOp [10]

(g) SV [11] (h) Shift-Map [9] (i) Texture Mask

Fig. 113. Input resolution is 500×275, output resolution is 250×275.

(a) Original Image (b) Ours (c) AAD [6]

(d) BDS [7] (e) Cropping (f) MultiOp [10]

(g) SV [11] (h) Shift-Map [9] (i) Texture Mask

Fig. 114. Input resolution is 500×281, output resolution is 375×281.

(a) Original Image (b) Ours (c) AAD [6]

(d) BDS [7] (e) Cropping (f) MultiOp [10]

(g) SV [11] (h) Shift-Map [9] (i) Texture Mask

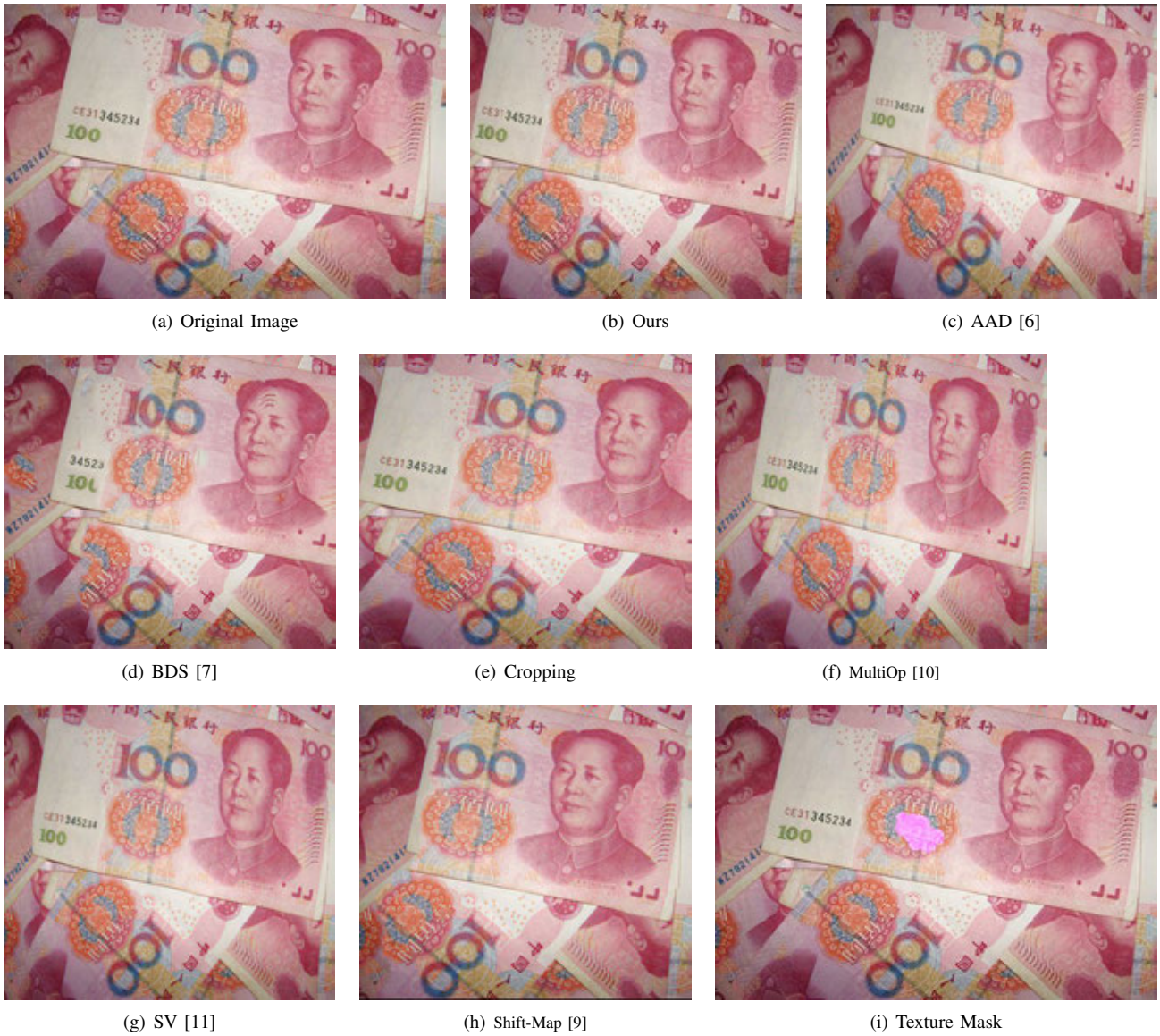
Fig. 115. Input resolution is 500×369, output resolution is 250×369.

(a) Original Image (b) Ours (c) AAD [6]

(d) BDS [7] (e) Cropping (f) MultiOp [10]

(g) SV [11] (h) Shift-Map [9] (i) Texture Mask

Fig. 116. Input resolution is 500×435, output resolution is 375×435.



(a) Original Image (b) Ours (c) AAD [6]

(d) BDS [7] (e) Cropping (f) MultiOp [10]

(g) SV [11] (h) Shift-Map [9] (i) Texture Mask

Fig. 117. Input resolution is 500×333, output resolution is 375×333.

(a) Original Image (b) Ours (c) AAD [6]

(d) BDS [7] (e) Cropping (f) MultiOp [10]

(g) SV [11] (h) Shift-Map [9] (i) Texture Mask

Fig. 118. Input resolution is 500×342, output resolution is 375×342.

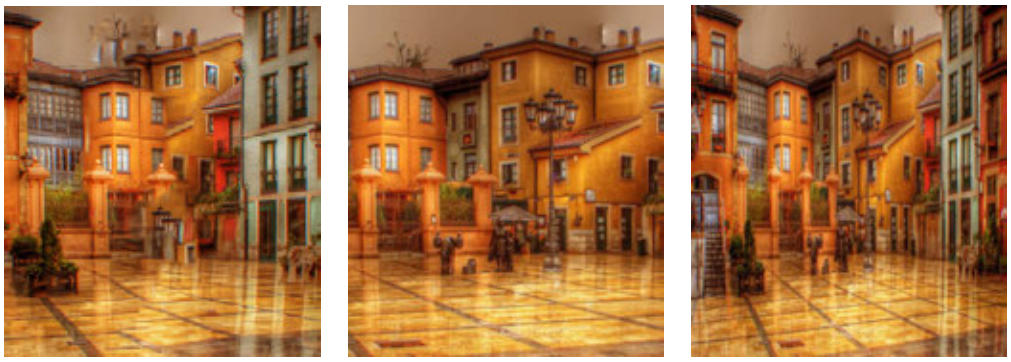
(a) Original Image (b) Ours (c) AAD [6]

(d) BDS [7] (e) Cropping (f) MultiOp [10]

(g) SV [11] (h) Shift-Map [9] (i) Texture Mask

Fig. 119. Input resolution is 500×333, output resolution is 250×333.

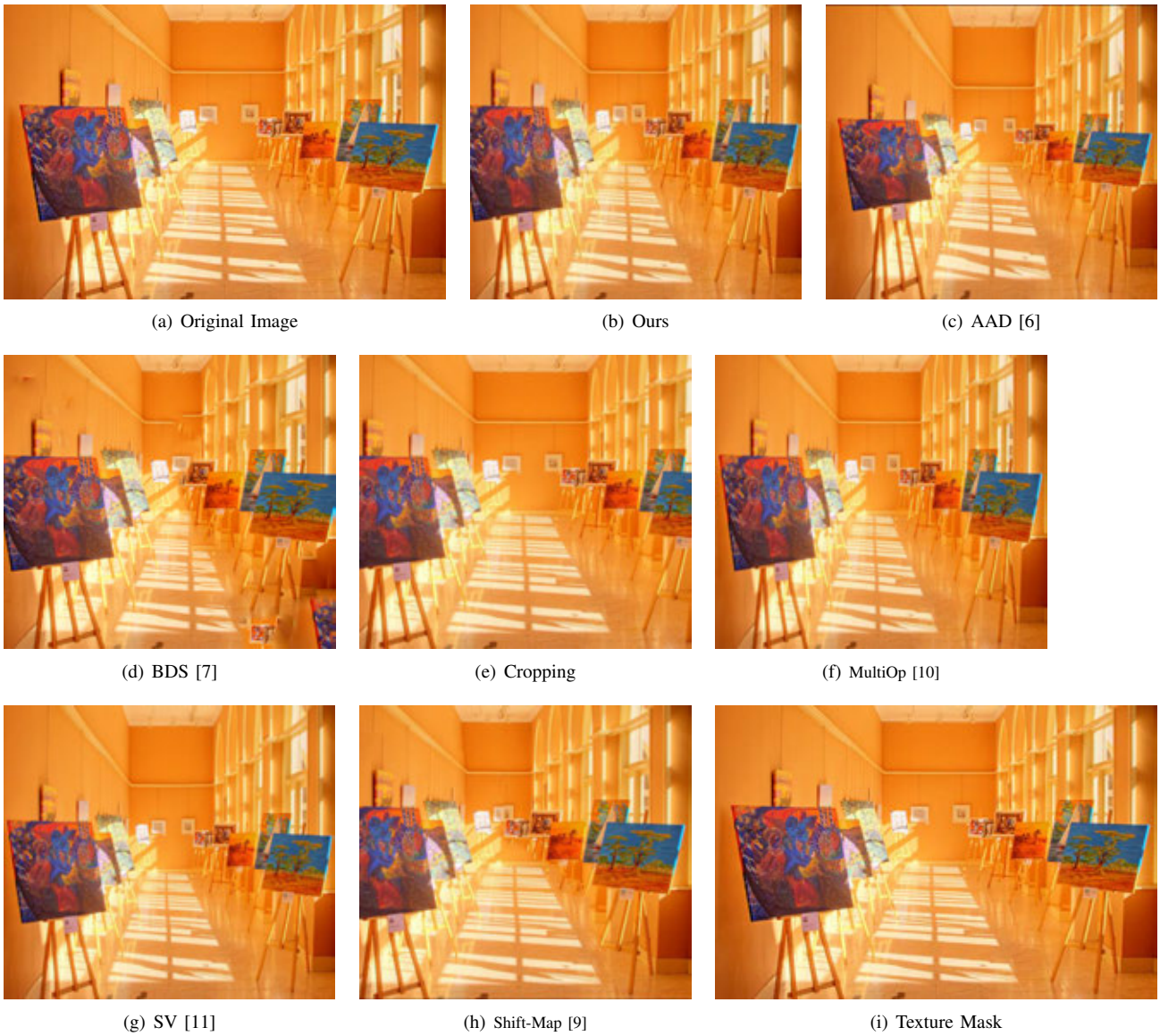
(a) Original Image (b) Ours (c) AAD [6]



(d) BDS [7] (e) Cropping (f) MultiOp [10]

(g) SV [11] (h) Shift-Map [9] (i) Texture Mask

Fig. 120. Input resolution is 500×277, output resolution is 250×277.



(a) Original Image (b) Ours (c) AAD [6]

(d) BDS [7] (e) Cropping (f) MultiOp [10]

(g) SV [11] (h) Shift-Map [9] (i) Texture Mask

Fig. 121. Input resolution is 500×333, output resolution is 375×333.

(a) Original Image (b) Ours (c) AAD [6]

(d) BDS [7] (e) Cropping (f) MultiOp [10]

(g) SV [11] (h) Shift-Map [9] (i) Texture Mask

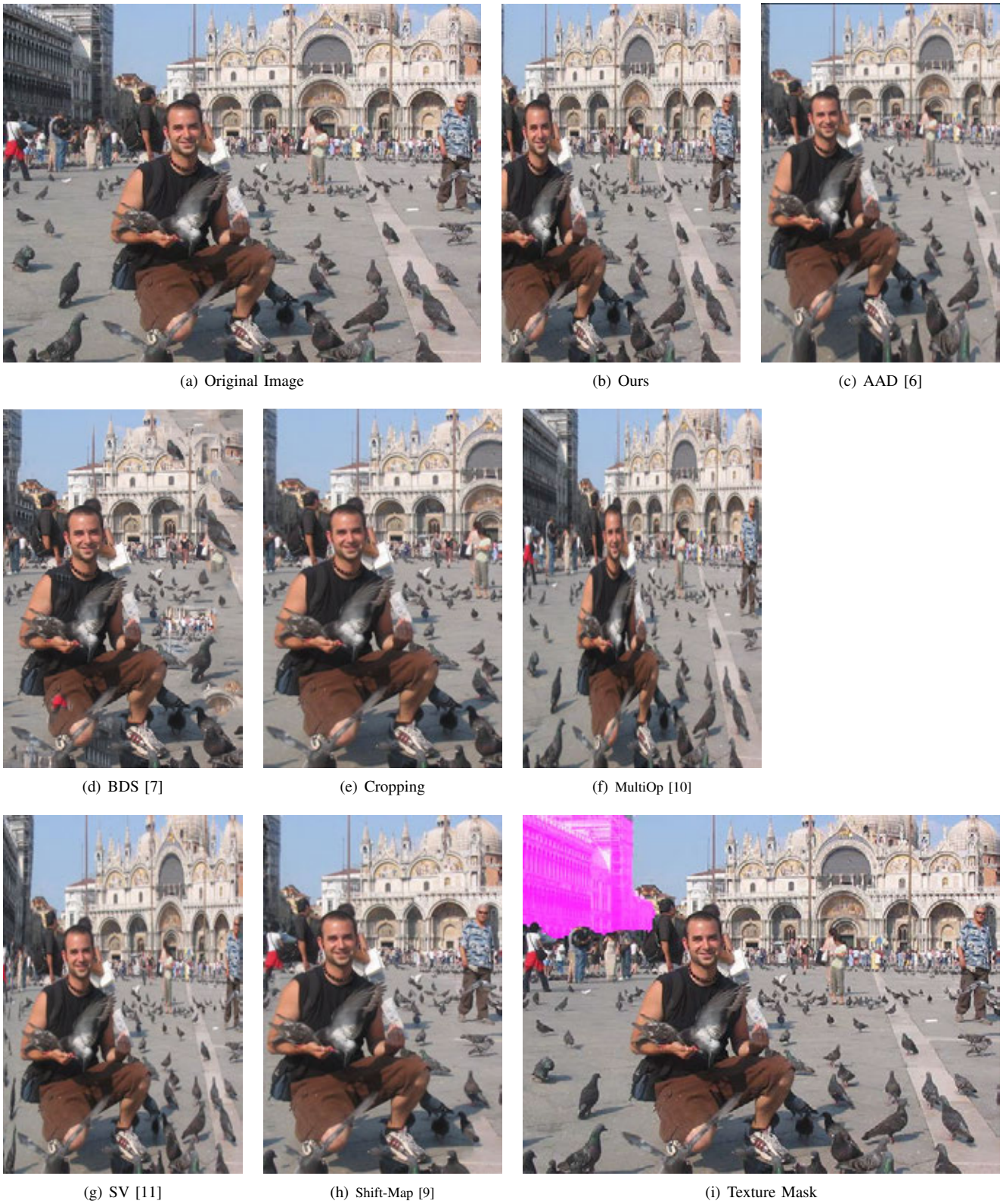
Fig. 122. Input resolution is 500×333, output resolution is 375×333.

(a) Original Image (b) Ours (c) AAD [6]

(d) BDS [7] (e) Cropping (f) MultiOp [10]

(g) SV [11] (h) Shift-Map [9] (i) Texture Mask

Fig. 123. Input resolution is 500×332, output resolution is 250×332.



(a) Original Image (b) Ours (c) AAD [6]

(d) BDS [7] (e) Cropping (f) MultiOp [10]

(g) SV [11] (h) Shift-Map [9] (i) Texture Mask

Fig. 124. Input resolution is 500×375, output resolution is 250×375.

(a) Original Image

(b) Ours

(c) AAD [6]

(d) BDS [7]

(e) MultiOp [10]

(f) SV [11]

(g) Shift-Map [9]

(h) Texture Mask

Fig. 125. Input resolution is 500×356, output resolution is 625×356.

(a) Original Image

(b) Ours

(c) AAD [6]

(d) BDS [7]

(e) Cropping

(f) MultiOp [10]

(g) SV [11]

(h) Shift-Map [9]

(i) Texture Mask

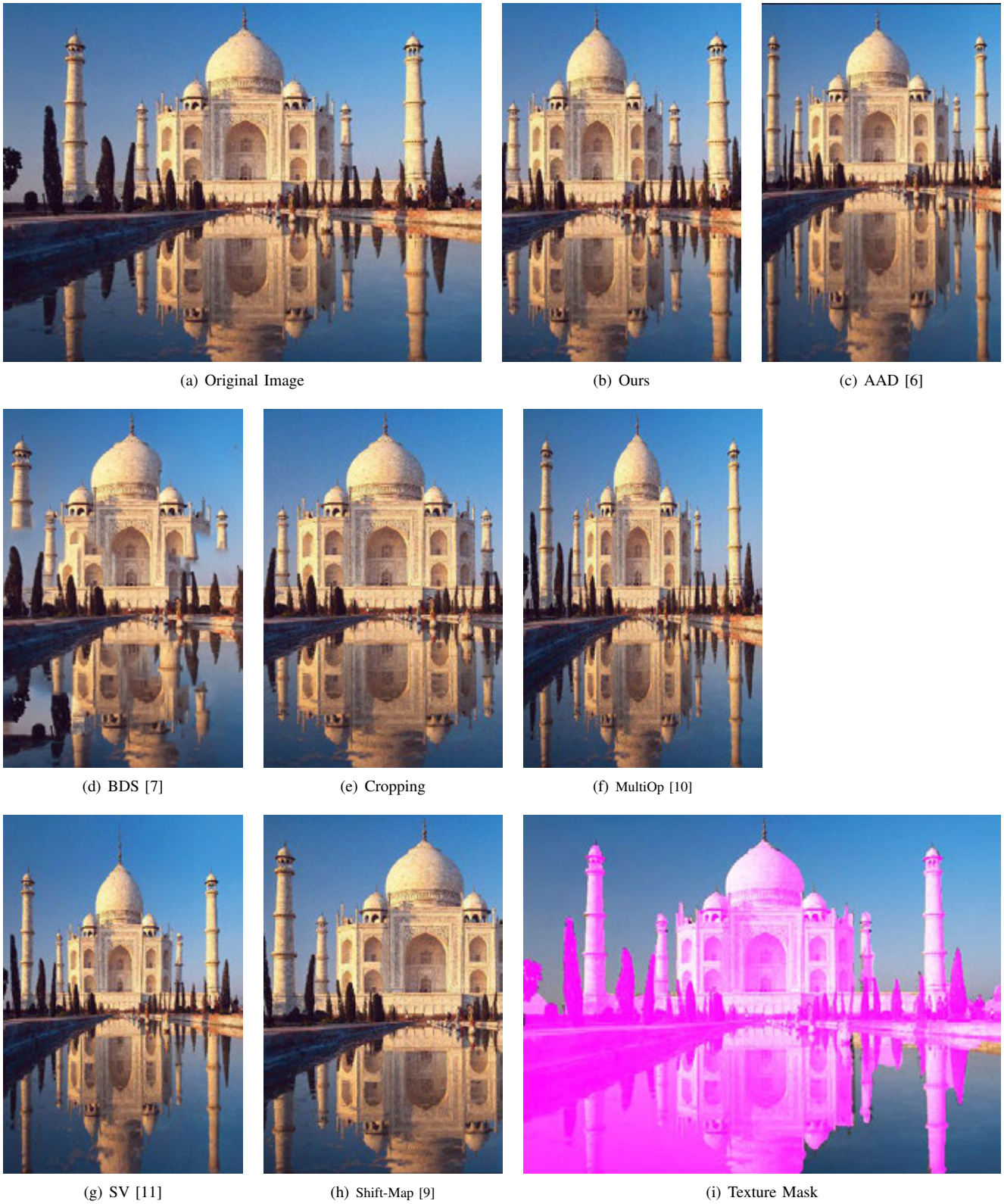
Fig. 126. Input resolution is 333×500, output resolution is 333×250.

(a) Original Image (b) Ours (c) AAD [6]

(d) BDS [7] (e) Cropping (f) MultiOp [10]

(g) SV [11] (h) Shift-Map [9] (i) Texture Mask

Fig. 127. Input resolution is 333×500, output resolution is 250×500.



(a) Original Image (b) Ours (c) AAD [6]

(d) BDS [7] (e) Cropping (f) MultiOp [10]

(g) SV [11] (h) Shift-Map [9] (i) Texture Mask

Fig. 128. Input resolution is 500×375, output resolution is 250×375.

(a) Original Image

(b) Ours

(c) AAD [6]

(d) BDS [7]

(e) Cropping

(f) MultiOp [10]

(g) SV [11]

(h) Shift-Map [9]

(i) Texture Mask

Fig. 129. Input resolution is 332×500, output resolution is 332×250.

(a) Original Image (b) Ours (c) AAD [6]

(d) BDS [7] (e) Cropping (f) MultiOp [10]

(g) SV [11] (h) Shift-Map [9] (i) Texture Mask

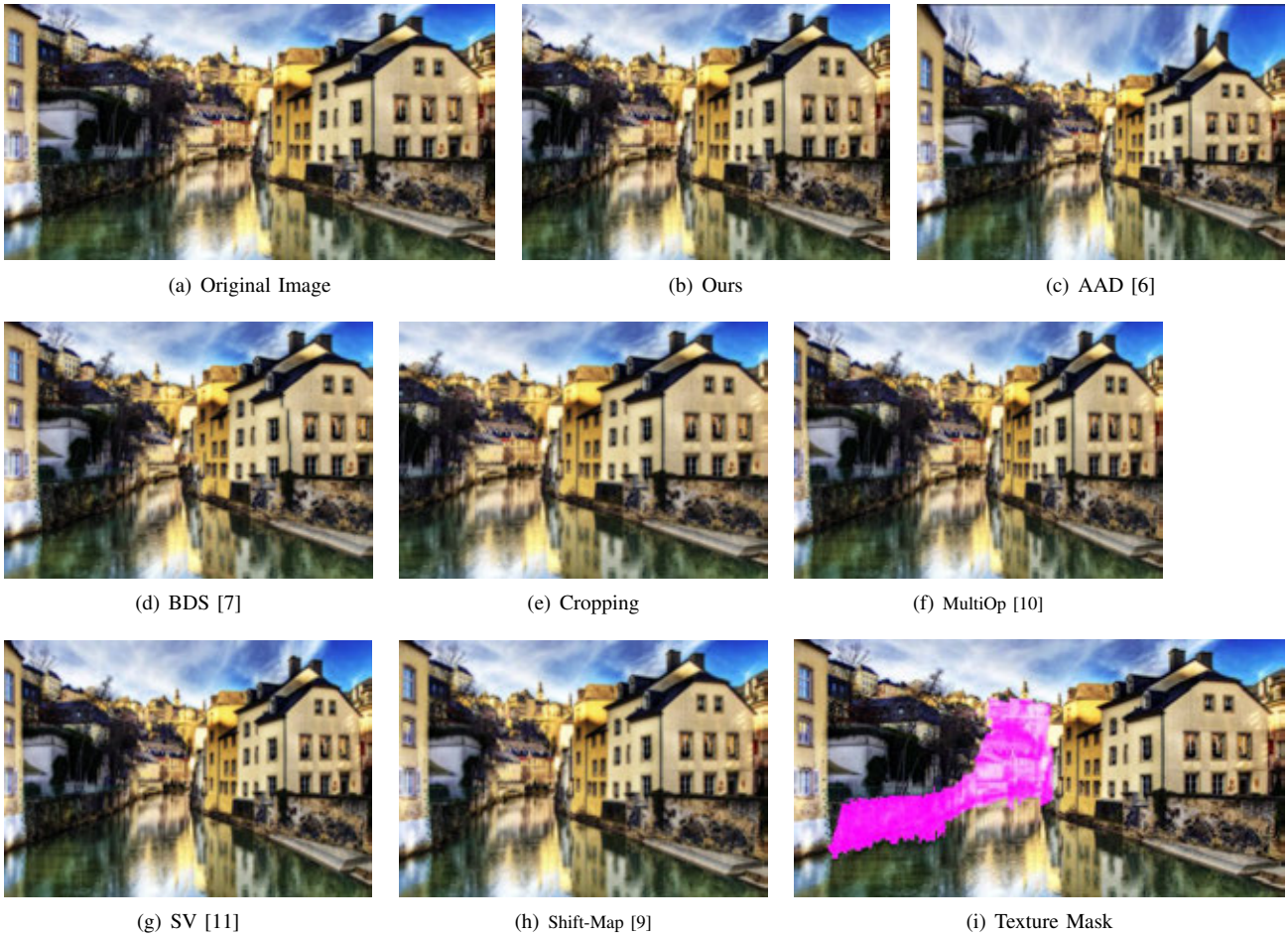
Fig. 130. Input resolution is 500×364, output resolution is 375×364.

(a) Original Image (b) Ours (c) AAD [6]

(d) BDS [7] (e) Cropping (f) MultiOp [10]

(g) SV [11] (h) Shift-Map [9] (i) Texture Mask

Fig. 131. Input resolution is 500×375, output resolution is 250×375.

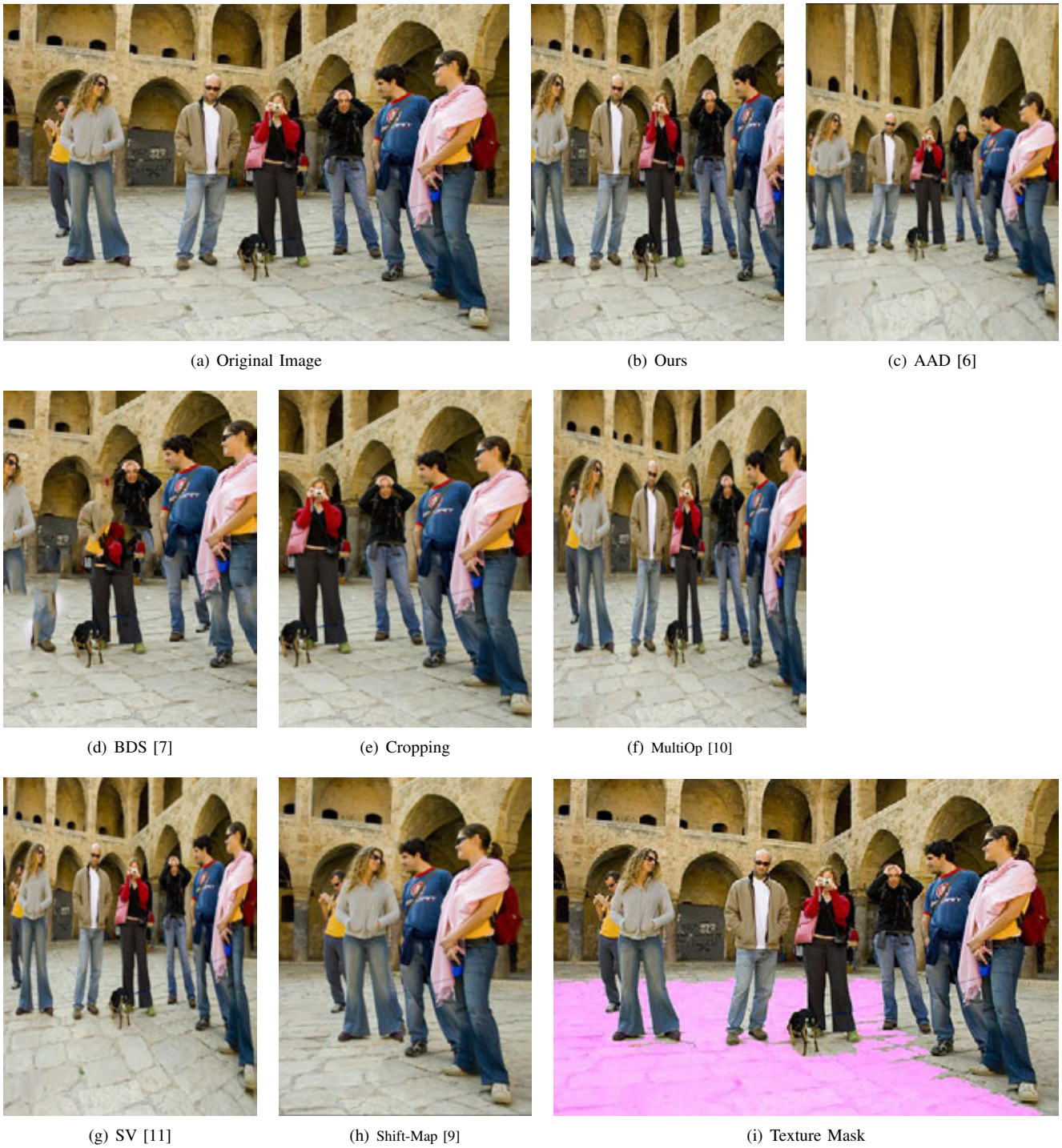


(a) Original Image (b) Ours (c) AAD [6]

(d) BDS [7] (e) Cropping (f) MultiOp [10]

(g) SV [11] (h) Shift-Map [9] (i) Texture Mask

Fig. 132. Input resolution is 500×261, output resolution is 375×261.



(a) Original Image (b) Ours (c) AAD [6]

(d) BDS [7] (e) Cropping (f) MultiOp [10]

(g) SV [11] (h) Shift-Map [9] (i) Texture Mask

Fig. 133. Input resolution is 500×333, output resolution is 250×333.

(a) Original Image

(b) Ours

(c) AAD [6]

(d) BDS [7]

(e) Cropping

(f) MultiOp [10]

(g) SV [11]

(h) Shift-Map [9]

(i) Texture Mask

Fig. 134. Input resolution is 332×500, output resolution is 332×375.

(a) Original Image

(b) Ours

(c) AAD [6]

(d) BDS [7]

(e) Cropping

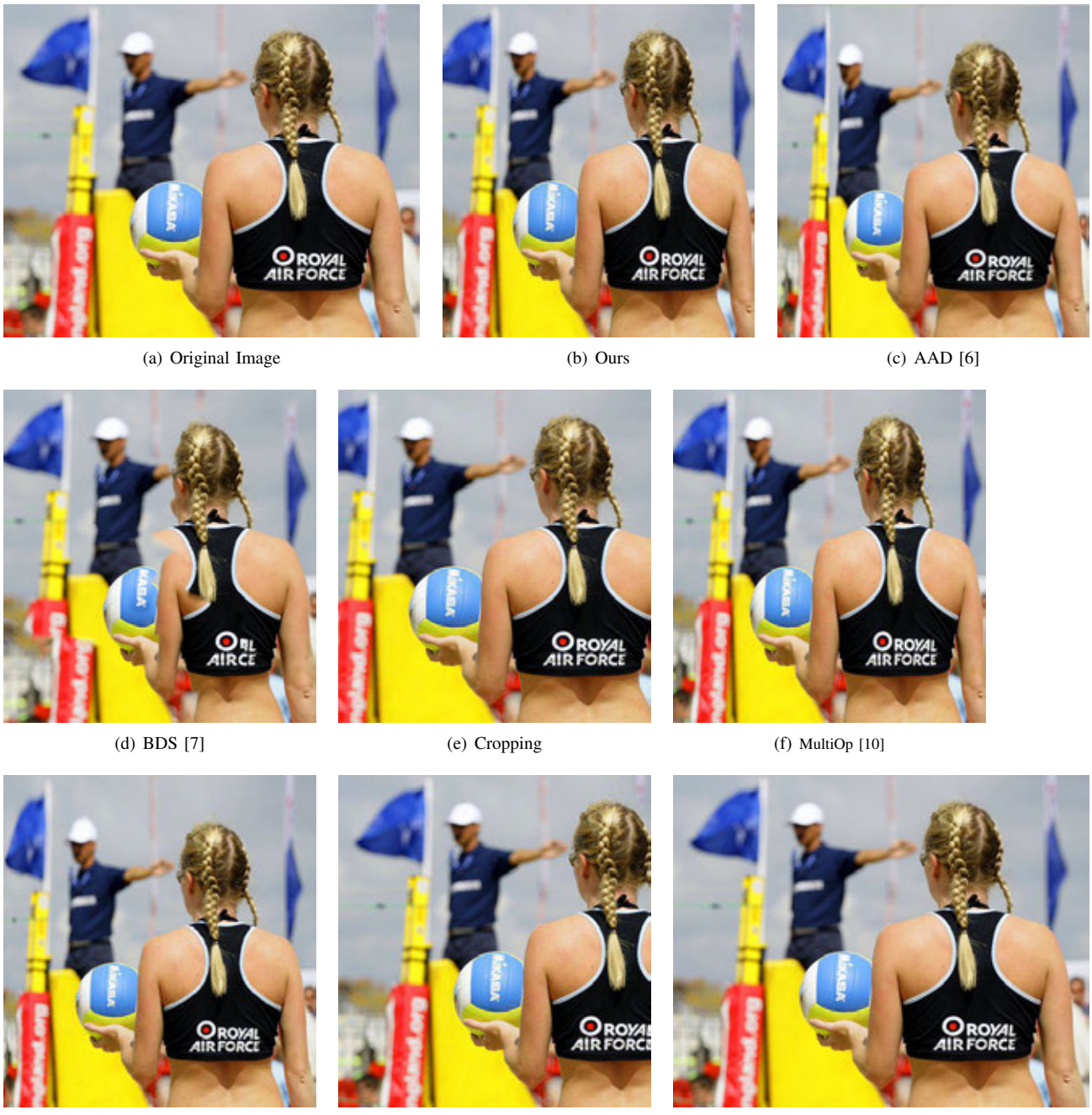
(f) MultiOp [10]

(g) SV [11]

(h) Shift-Map [9]

(i) Texture Mask

Fig. 135. Input resolution is 333×500, output resolution is 333×375.



(a) Original Image (b) Ours (c) AAD [6]

(d) BDS [7] (e) Cropping (f) MultiOp [10]

(g) SV [11] (h) Shift-Map [9] (i) Texture Mask

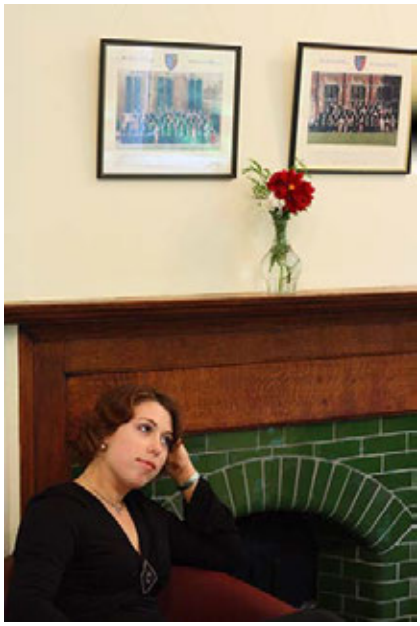
Fig. 136. Input resolution is 500×400, output resolution is 375×400.

(a) Original Image (b) Ours (c) AAD [6]

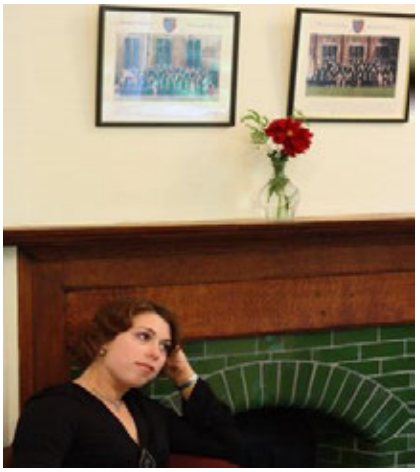
(d) BDS [7] (e) Cropping (f) MultiOp [10]

(g) SV [11] (h) Shift-Map [9] (i) Texture Mask

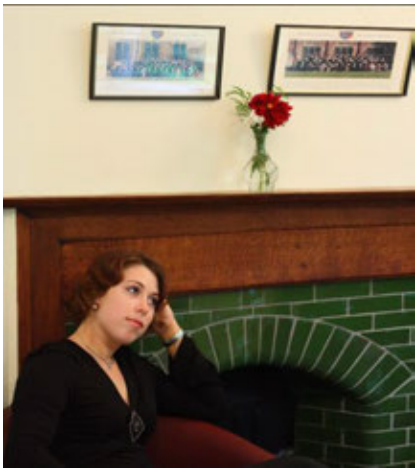
Fig. 137. Input resolution is 500×333, output resolution is 375×333.



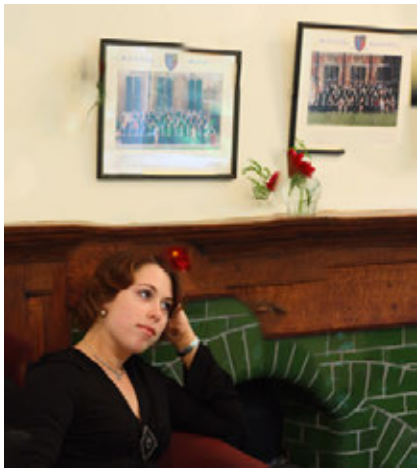
(a) Original Image



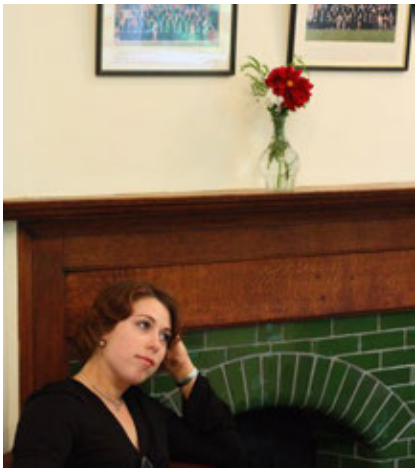
(b) Ours



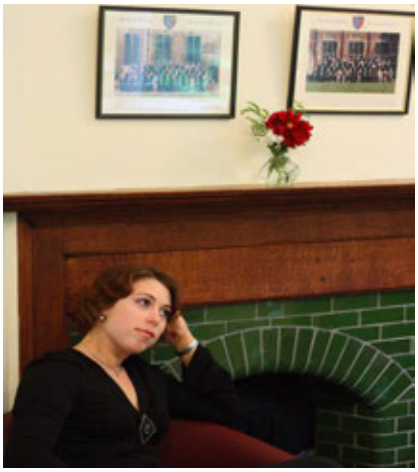
(c) AAD [6]



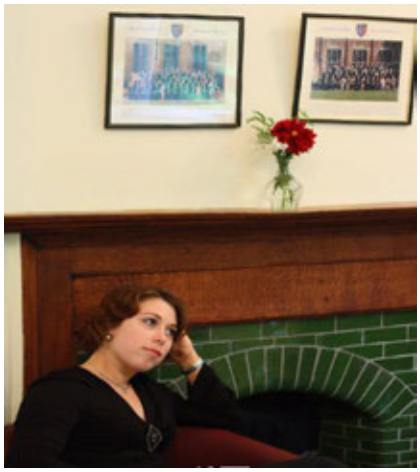
(d) BDS [7]



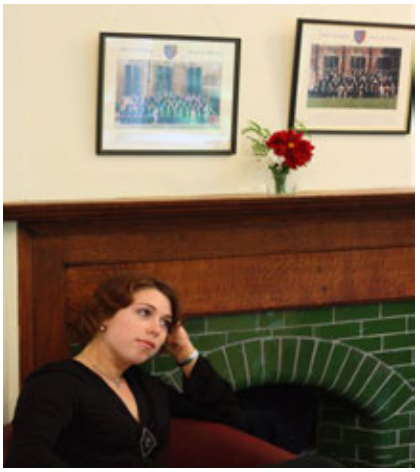
(e) Cropping



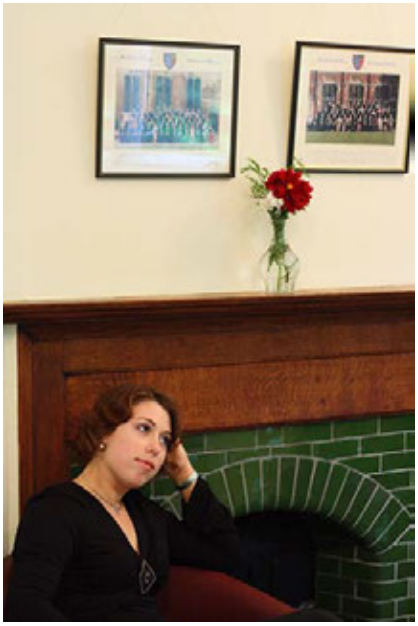
(f) MultiOp [10]



(g) SV [11]



(h) Shift-Map [9]



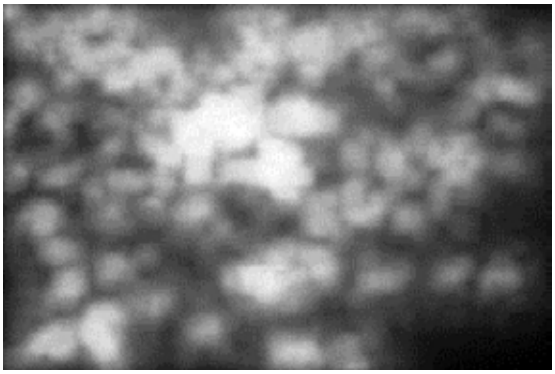
(i) Texture Mask

Fig. 138. Input resolution is 333×500, output resolution is 333×375.

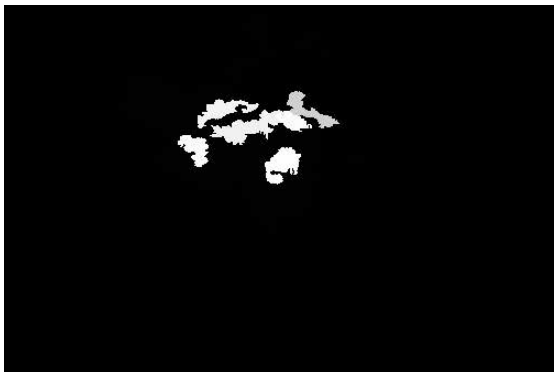
(a) Original Image

(b) Our saliency map

(c) RC [12]

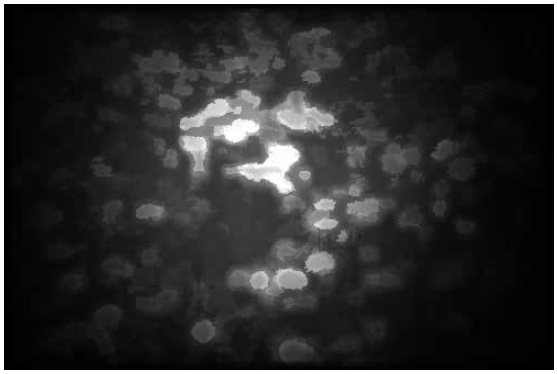


(d) CAS [13]



(e) SDG [14]

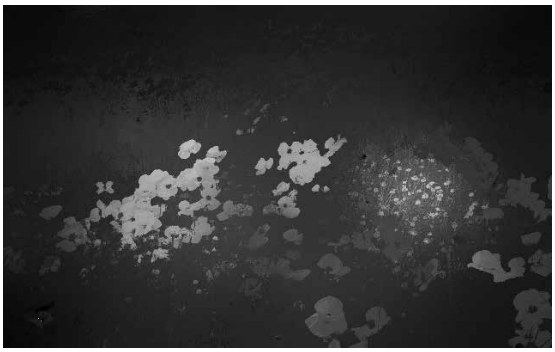
(f) HSD [15]



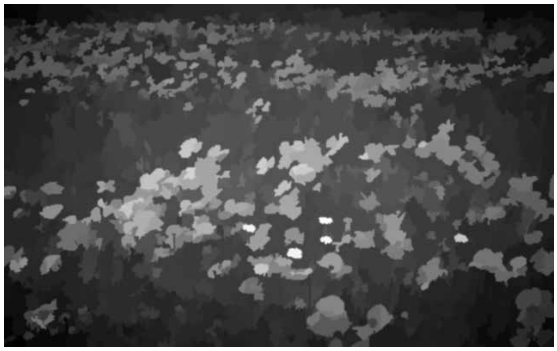
(g) WMP [16]

Fig. 139. Comparison of our saliency detection result and the results of some state-of-the-art methods.

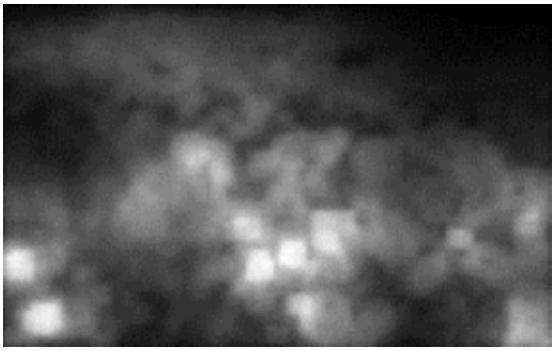
(a) Original Image



(b) Our saliency map

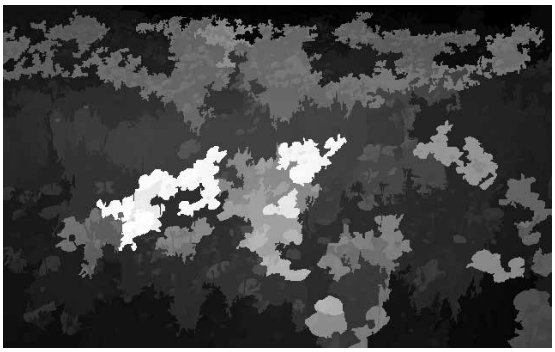


(c) RC [12]

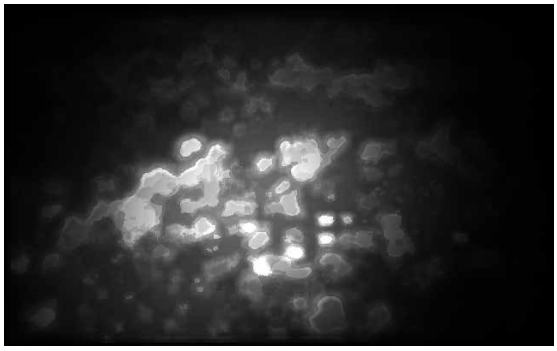


(d) CAS [13]

(e) SDG [14]

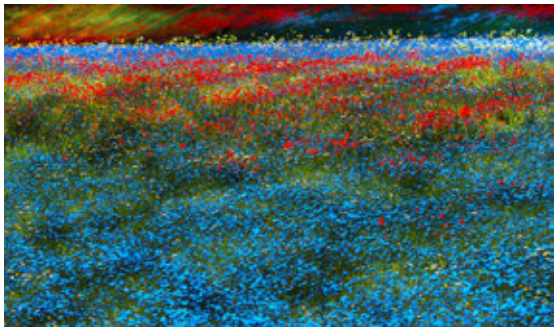


(f) HSD [15]



(g) WMP [16]

Fig. 140. Comparison of our saliency detection result and the results of some state-of-the-art methods.

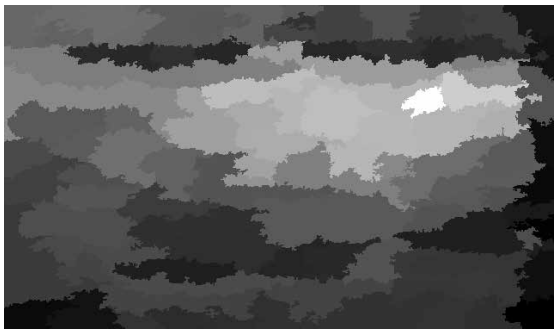


(a) Original Image

(b) Our saliency map

(c) RC [12]

(d) CAS [13]



(e) SDG [14]

(f) HSD [15]

(g) WMP [16]

Fig. 141. Comparison of our saliency detection result and the results of some state-of-the-art methods.