Spatially-Varying Blur Detection Based on Multiscale Fused and Sorted Transform Coefficients of Gradient Magnitudes -Supplementary Material-

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Supplementary Material

In this supplementary material, we provide more qualitative comparisons of our proposed method to existing state-of the-art-algorithms that are designed for both motion and defocus blur types [26, 27, 28, 32]. Moreover, we provide more examples of the applications of our proposed method in camera focus points estimation, blur magnification, and deblurring.

In Figure 1, we evaluate the performance of our method as well as state-of-the-art methods that on six simulated blur types including Lens, Gaussian, Motion, Radial, Zoom, and Surface blur. As shown in Figure 1, our proposed method can handle all these blur types accurately compared to the ground-truth. Moreover, in the last row of Figure 1, we provide thresholded results of our proposed method to demonstrate its potential in segmenting blurred and unblurred regions.

In Figure 2, we evaluate the the performance of our method as well as state-of-the-art methods qualitatively on images undergoing different types and levels of distortions, such as zero-mean Gaussian noise, adaptive noise, JPEG, and JPEG2000. As shown in Figure 2, although most of the state-of-the-art methods fail to perform well on distorted images, our method performs well for high and average quality images. As the quality of the images decreases to low quality, the performance of our method decreases.

In Figure 3, we consider images which are taken by a Canon EOS 70D camera under a static scene. In Figure 3(a), we focus on the face of each of the objects. In Figure 3(b), we provide a zoom-in part of the selected regions in Figure 3(a) inside the square to illustrate the unblurred region better. Figure 3(c) shows the estimated blur map for each of the images in Figure 3(a) with the larger values representing more sharp/unblurred regions. In Figure 3(d), we threshold the results in Figure 3(c), and in Figure 3(f), we compute the camera focus points map as explained in the paper (red spot inside the square).

Figure 4 illustrates another example of blur magnification using our proposed blur detection method. Here we also show the thresholded (4(d)) result from the estimated blur map (4(c)) to show its similarity to the ground truth (4 (b)).

In Figure 5, we provide more examples on image deblurring while incorporating our estimated blur map in method [25].

In Figures 6, 7, and 8 we provide more qualitative comparisons of our proposed method to the state-of-the-art methods designed for both defocus and motion blur images. Please note that here we do not add any noise/artifacts to the input images.

References

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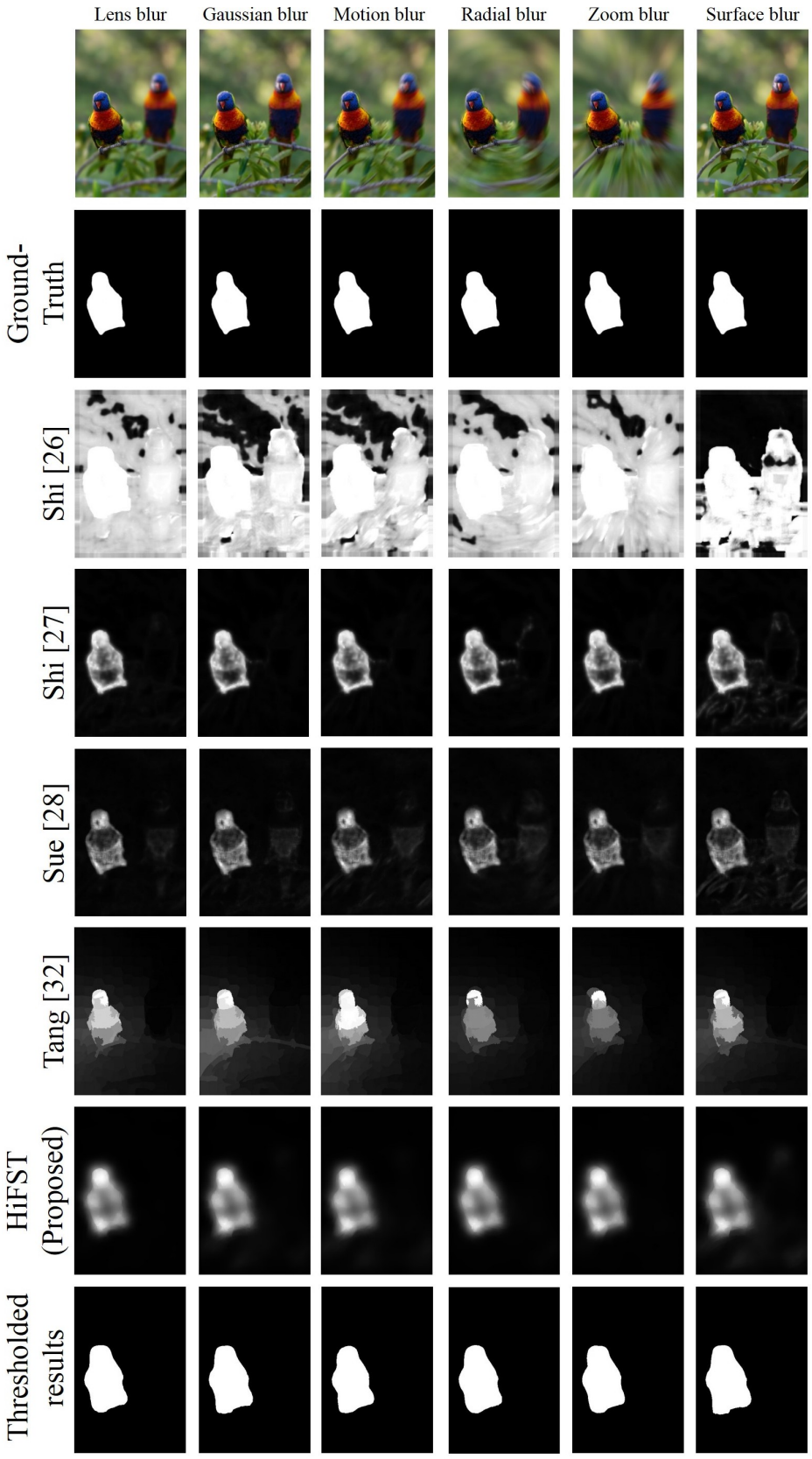

Figure 1. Visual comparison of our proposed method to state-of-the-art methods for different blur type images.

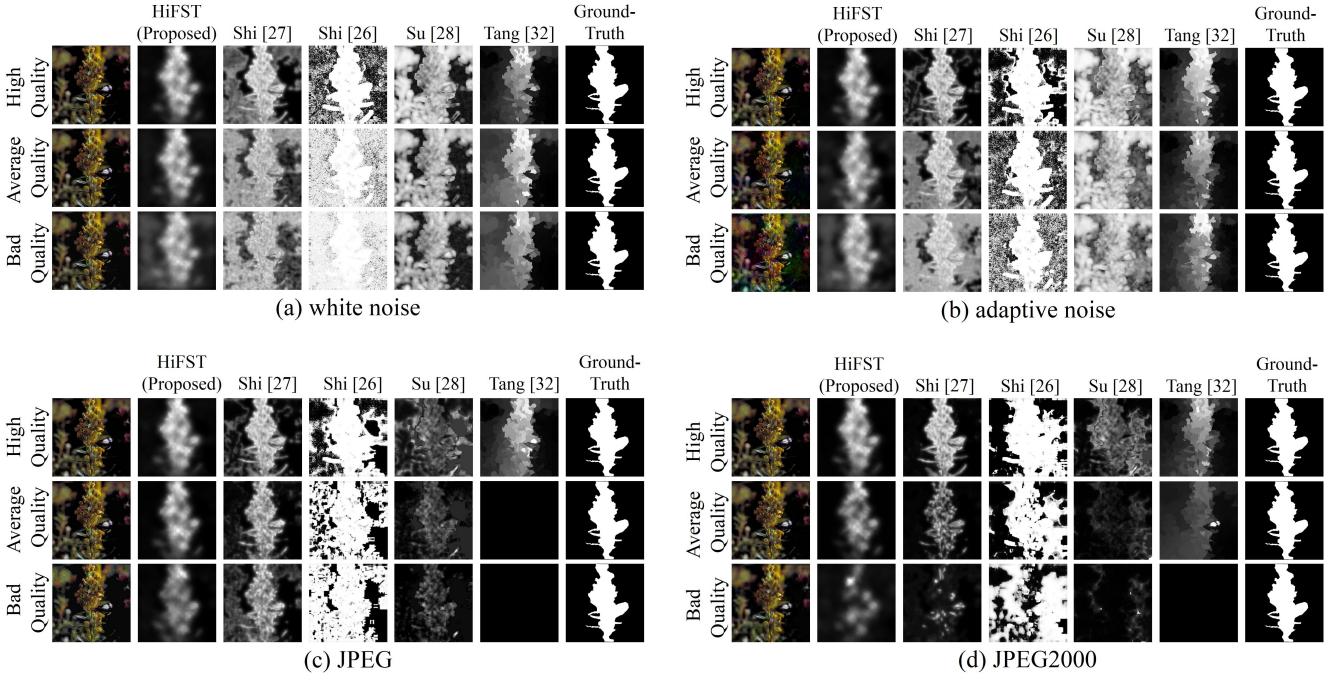

Figure 2. Qualitative comparison of our proposed method to state-of-the-art methods for images undergoing different distortions in different levels.

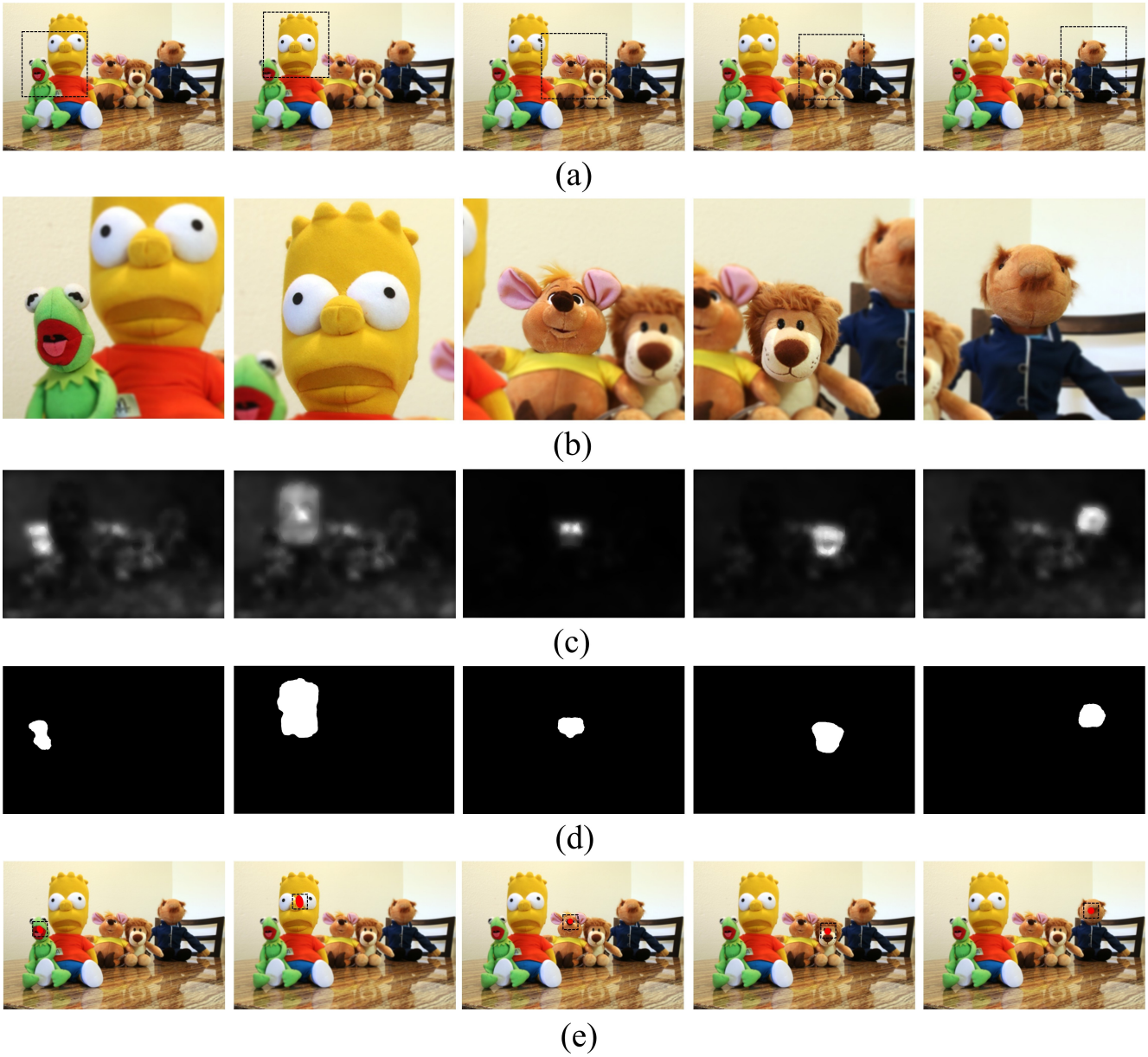

Figure 3. Qualitative evaluation of proposed method. (a) Input images while the camera focus is on the face of each of the objects from left to right. (b) Close up images of the area in the square in images in (a). (c) Our blur detection map. (d) Thresholded results of our proposed map in (c). (e) Computed camera focus points using our proposed method.

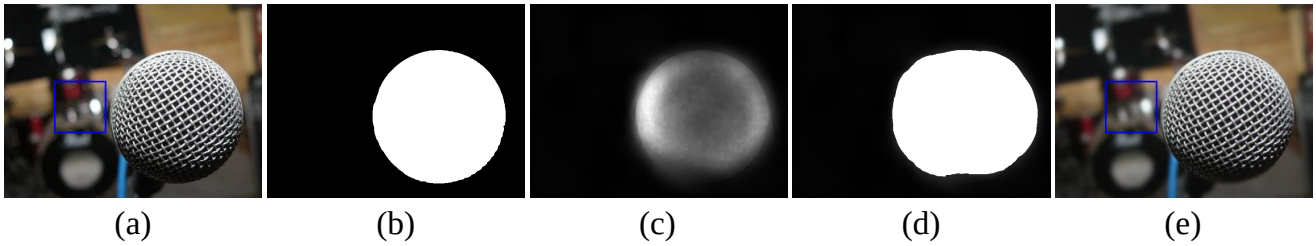

Figure 4. Blur magnification. (a) Input image, (b) ground truth, (c) our estimated blur map, (d) thresholded result from the image (c), (e) results after blur magnification using our proposed blur map.

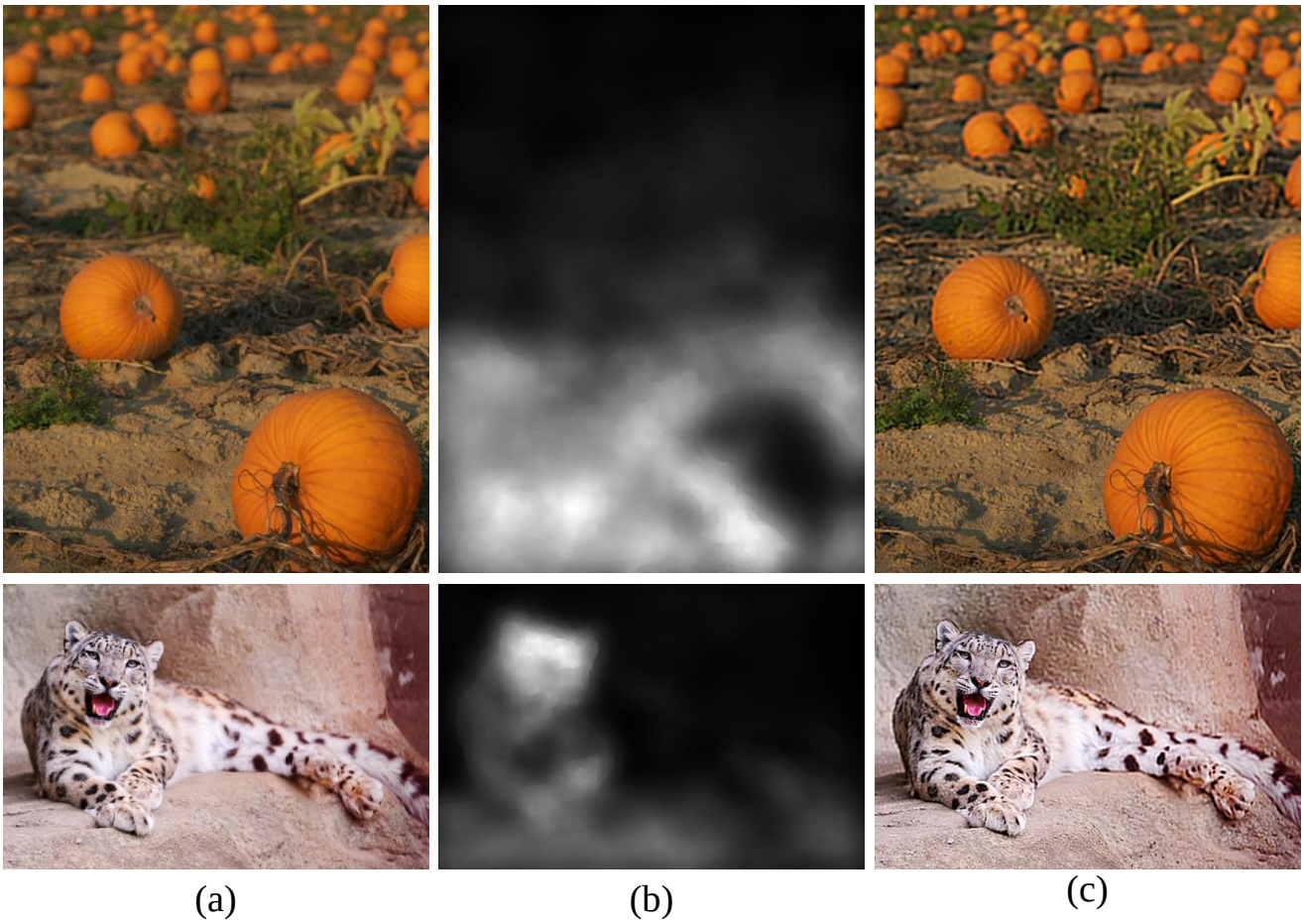

Figure 5. Deblurring, (a) input images, (b) estimated blur maps, (c) deblurred results.

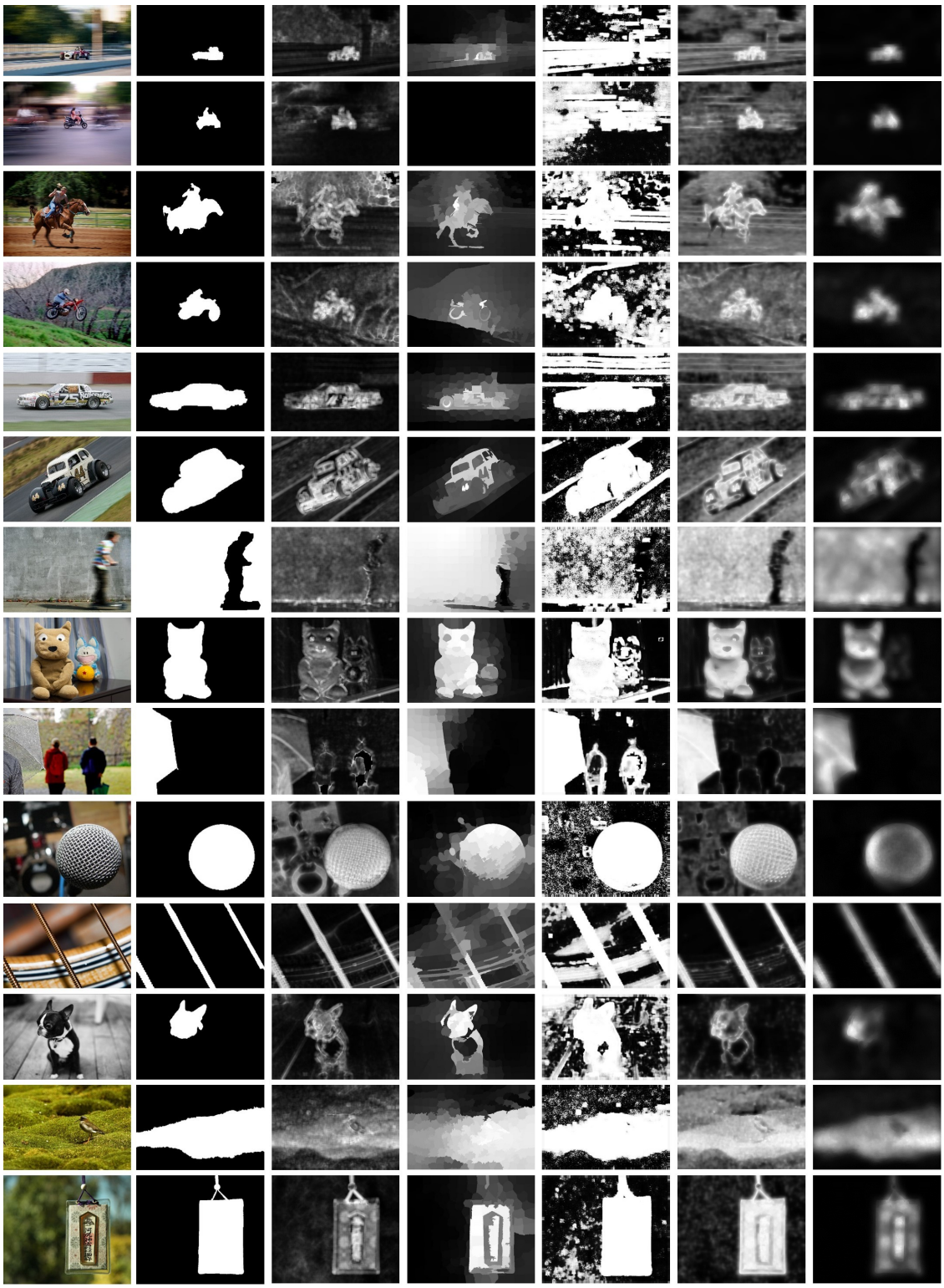

Figure 6. Visual comparison.

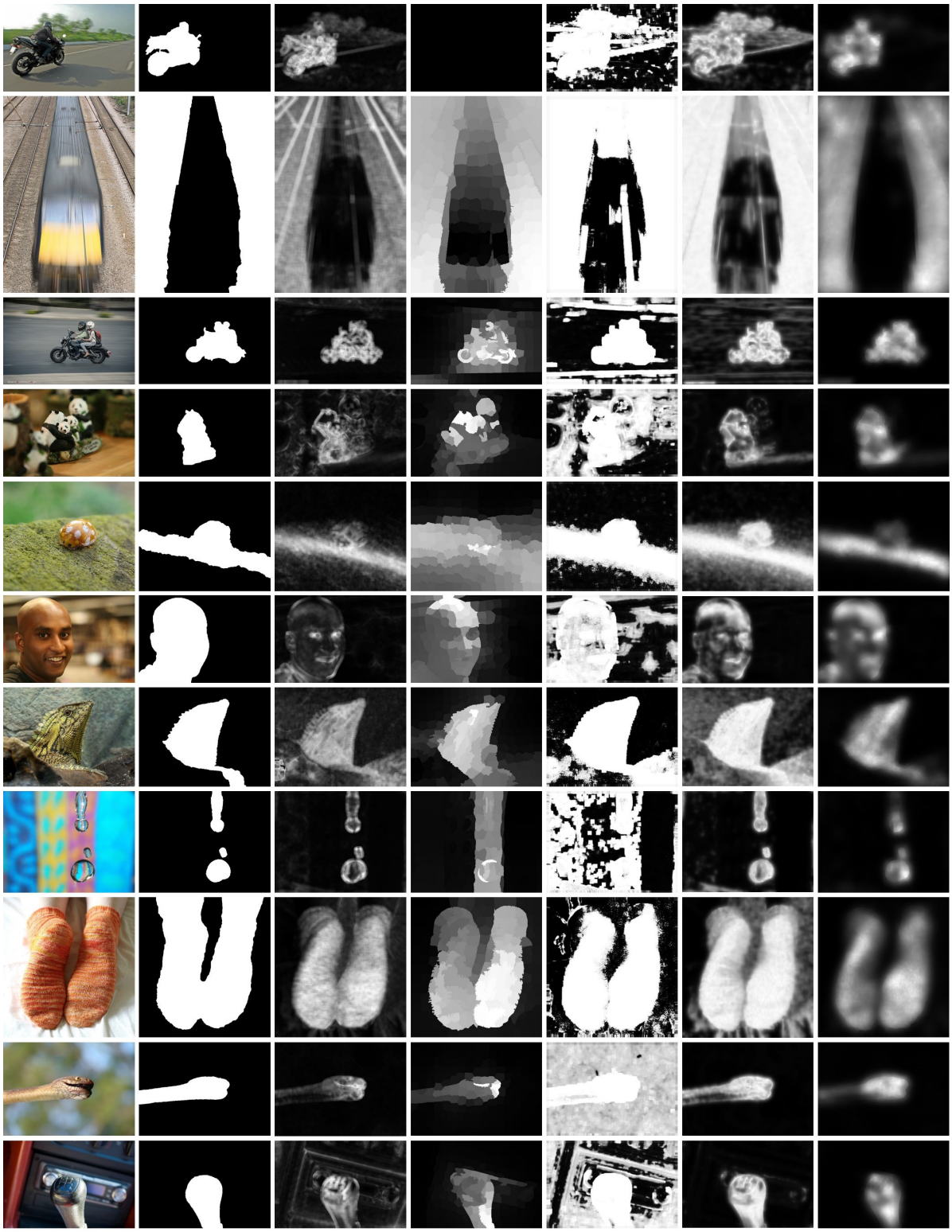

Figure 7. Visual comparison.

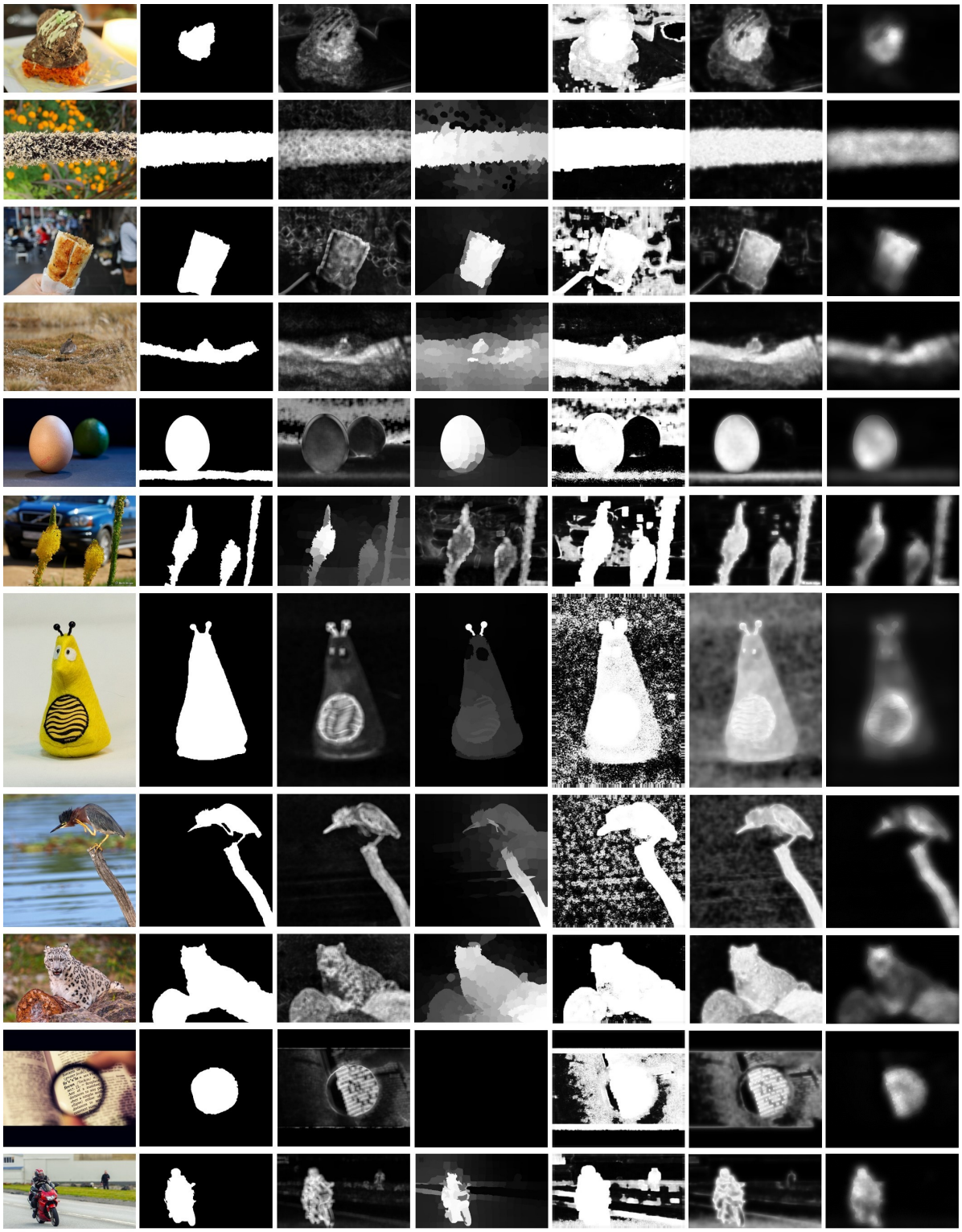

Figure 8. Visual comparison.