CTDNet: Cartoon-texture decomposition-based gray image super-resolution network with multiple degradations

Shi BaoShun, Xu WenYuan, Yang XiuWei

I. Supplementary Material

A. Comparisons with existing methods on synthetic dataset

We provide additional SR visualize results on LR images that obtained by blurring, down-sampling and adding noise to the HR images in Fig. 1-Fig. 3. It is worth mentioning that the important differences in the restoration quality between the algorithms under comparison have been amplified.

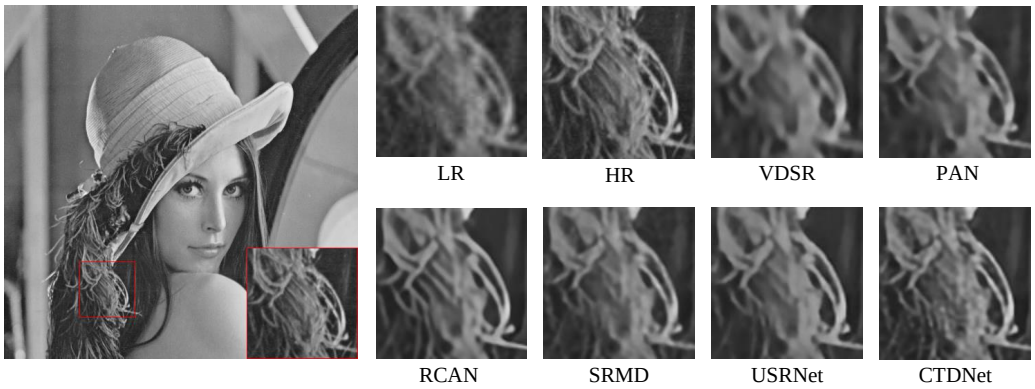

Figure 1. Reconstructed SR results of "lena" in Set12 for x2 SR on noise level $\sigma = 5$. We only show the partial zoom of the image. In the figure above, the CTDNet algorithm recovers much finer texture.

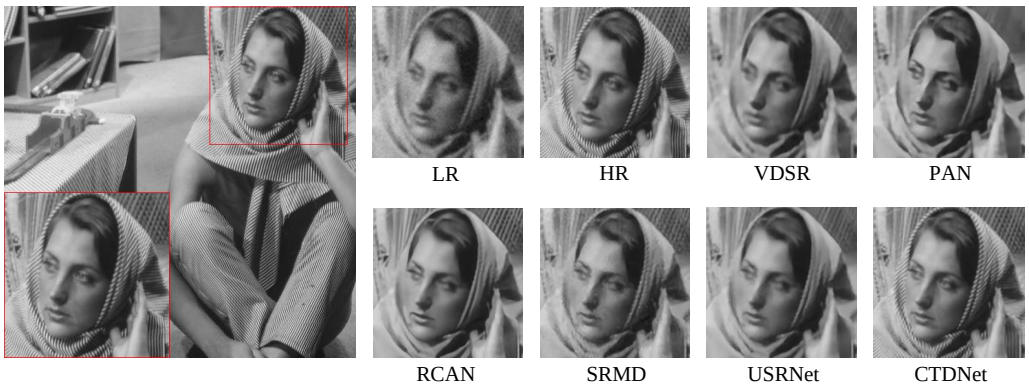

Figure 2. Reconstructed SR results of "barbara" in Set12 for x2 SR on noise level $\sigma = 5$. We only show the partial zoom of the image. It can be seen that the CTDNet algorithm recovers the texture detail at the hood of this woman very well.

Manuscript submitted Oct. 2022. This work was supported by the National Natural Science Foundation of China under Grants 61901406, by the Natural Science Foundation of Hebei Province under Grant F2020203025, by the Young Talent Program of Universities and Colleges in Hebei Province under Grant BJ20211044, by the Hebei Key Laboratory Project under Grants 202250701010046, and by the Central Government Guides Local Science and Technology Development Fund Projects under Grants 216Z1602G.

B.S. Shi (Corresponding author) and W.Y. Xu are with the School of Information Science and Engineering, Yanshan University, China. X.W. Yang is with the Institute of Automation, Qilu University of Technology (Shandong Academy of Sciences), China. (E-mail: shibaoshun@ysu.edu.cn).

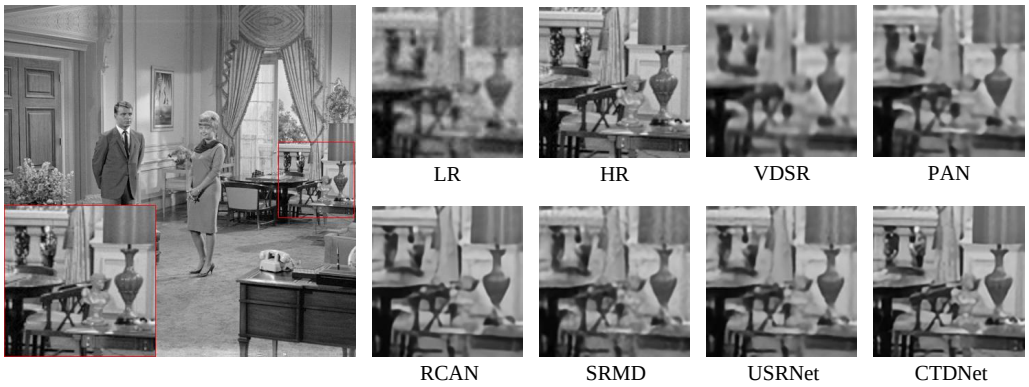

Figure 3. Reconstructed SR results of "couple" in Set12 for x2 SR on noise level $\sigma = 5$. We only show the partial zoom of the image. As can be seen from the two vases in the top left corner, the CTDNet recovery is much better.

B. Comparisons with existing methods on real terahertz image

Since the ground-truth terahertz images do not exist, we cannot provide quantitative comparisons. The evaluation of different algorithms can only be done by visually comparing their recovery results. Therefore, the main goal of our comparison is to assess the percepual quality. In Fig. 4 and Fig. 5, we show the qualitative results achieved by different methods on real terahertz images obtained from the actual acquisition. As we can see from the figures, most algorithms fail to reconstruct clear structures and suffer from blurry effects. In contrast, the CTDNet recovers many precise details and can restore accurate structures. CTDNet_BAR achieves better visual quality with fewer artifacts at the boundary.

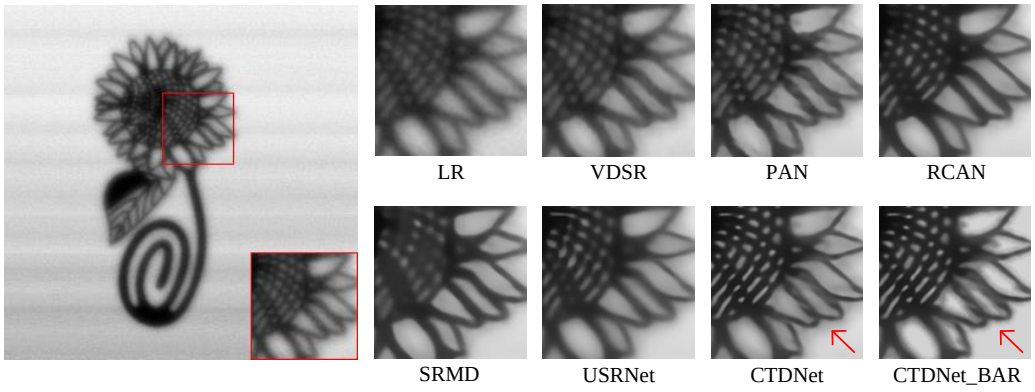

Figure 4. Reconstructed SR results of a real terahertz image which is obtained by scanning a sunflower in brass. The CTDNet algorithm recovers the internal texture more clearly and CTDNet_BAR reduces the boundary artifacts of the external petals.

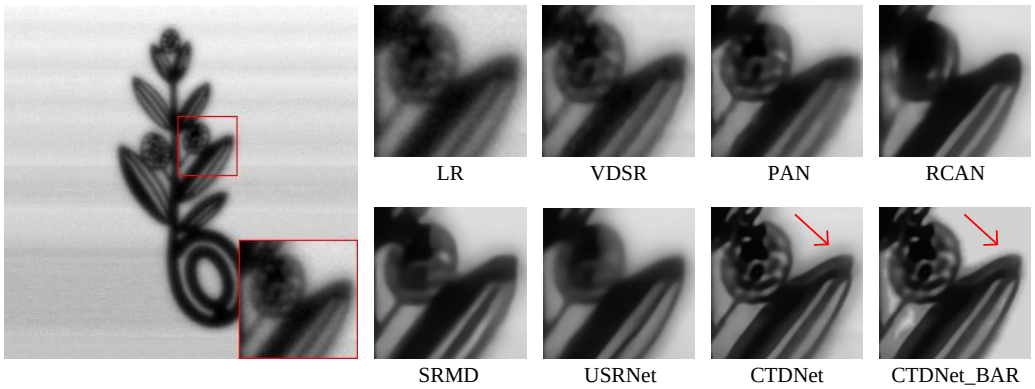

Figure 5. Reconstructed SR results of a real terahertz image which is obtained by scanning a tulip in brass. CTDNet algorithm recovers a clearer floral skeleton and CTDNet_BAR reduces the boundary artifacts of the leaf.