# CTDNet: Cartoon-Texture Decomposition-based Gray Image Super-Resolution Network with Multiple Degradations

Baoshun Shi, *Member, IEEE*, Wenyuan Xu, and Xiuwei Yang

## I. Supplementary Material

### A. Comparisons with existing methods on the synthetic dataset

We provide some SR visual results of the LR synthetic images in the case of multiple degradations in Fig. 1-Fig. 3. It can be observed that VDSR and PAN tend to produce over-smoothed results in most figures. RCAN, SRMD, and USRNet lead to performance improvements but they still have difficulty in recovering fine details. In contrast, CTDNet yields plausible textural details and obtains more clear edges compared with the benchmark methods.

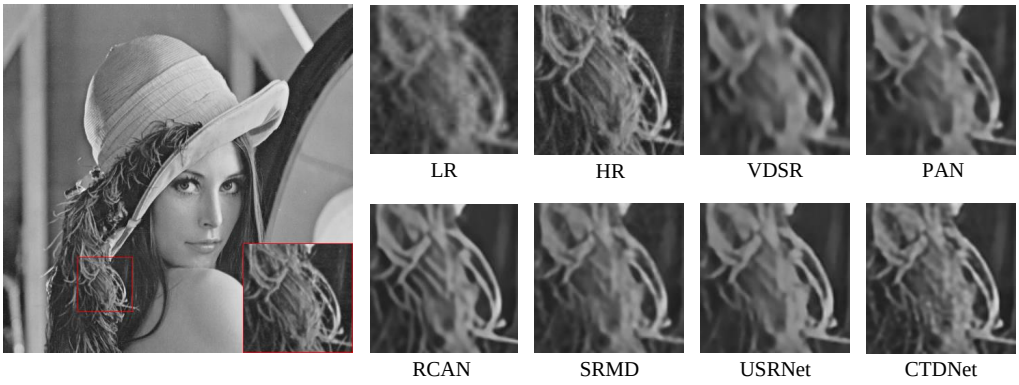


Fig. 1. Reconstructed SR results of "lena" in Set12 for x2 SR on noise level $\sigma = 5$. We only show the partial zoom of the image. In the figure above, CTDNet can recover plausible textural details.

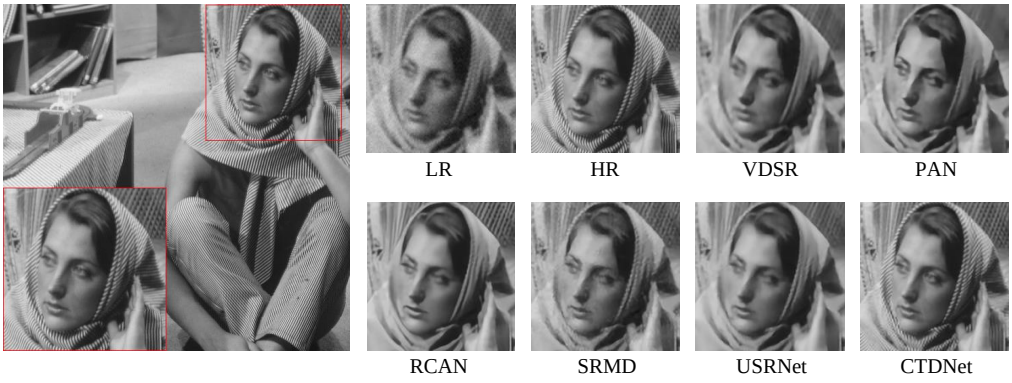


Fig. 2. Reconstructed SR results of "barbara" in Set12 for x2 SR on noise level $\sigma = 5$. We only show the partial zoom of the image. It can be seen that CTDNet can recover textural details at the hood of this woman very well.

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B. S. Shi (Corresponding author, E-mail: shibaoshun@ysu.edu.cn) 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.

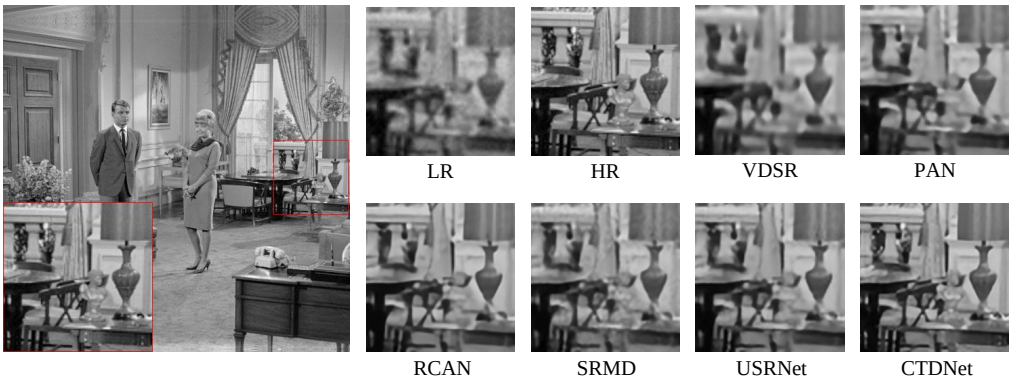


Fig. 3. Reconstructed SR results of "couple" in Set12 for x2 SR on noise level $\sigma = 5$. We only show the partial zoom of the image. As can be seen from the two vases in the top left corner, CTDNet recovery is much better.

### *B. Comparisons with existing methods on real terahertz images*

In Fig. 4 and Fig. 5, we show some qualitative results achieved by different SR algorithms on real terahertz images acquired by the TDS system. As we can see from the figures, most algorithms fail to recover clear structures, and their SR results contain ambiguous components. In contrast, CTDNet not only preserves many precise details but also recovers many accurate structures. Furthermore, one can see from the figures that the edges recovered by CTDNet_BAR are sharper than those of CTDNet, which indicates the effectiveness of the BAR method.

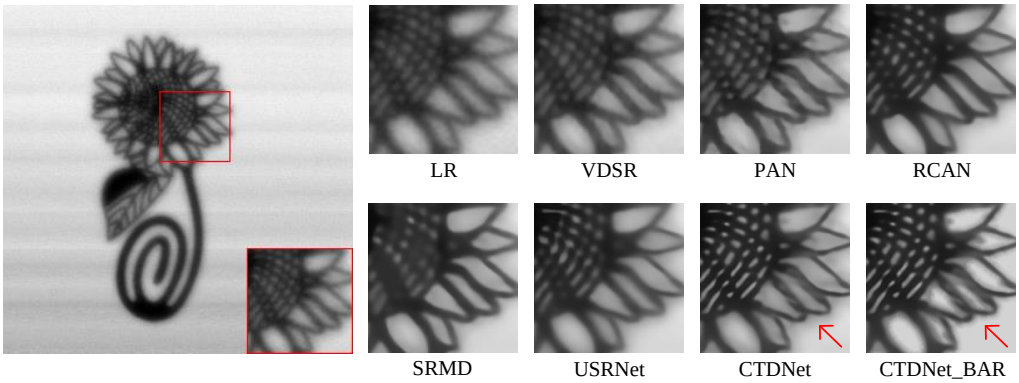


Fig. 4. Reconstructed SR results of a real terahertz image which is obtained by scanning a sunflower in brass. CTDNet can recover the internal texture more clearly and CTDNet_BAR reduces the boundary artifacts of the external petals.

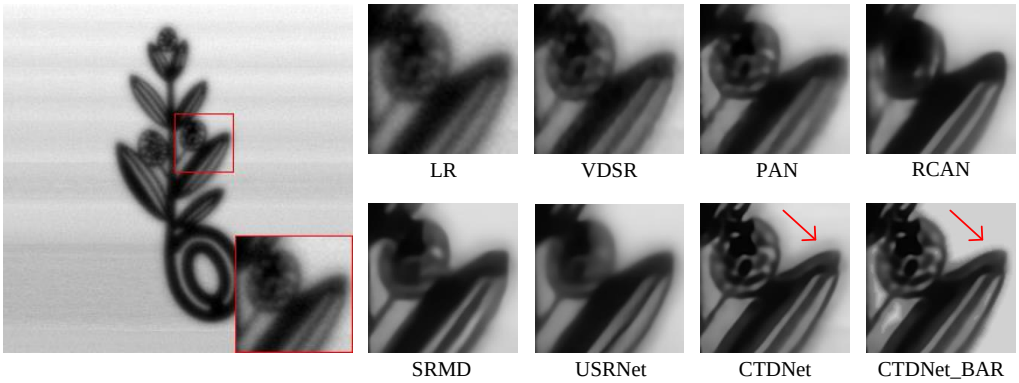


Fig. 5. Reconstructed SR results of a real terahertz image which is obtained by scanning a tulip in brass. CTDNet can recover a clear floral skeleton and CTDNet_BAR reduces the boundary artifacts of the leaf.