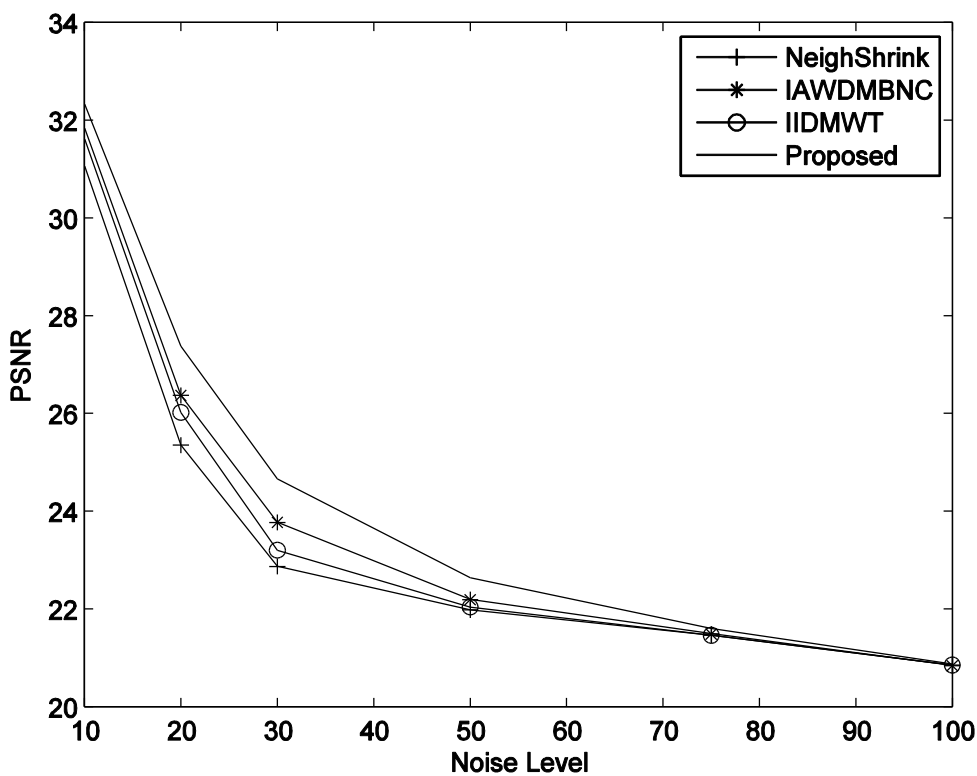
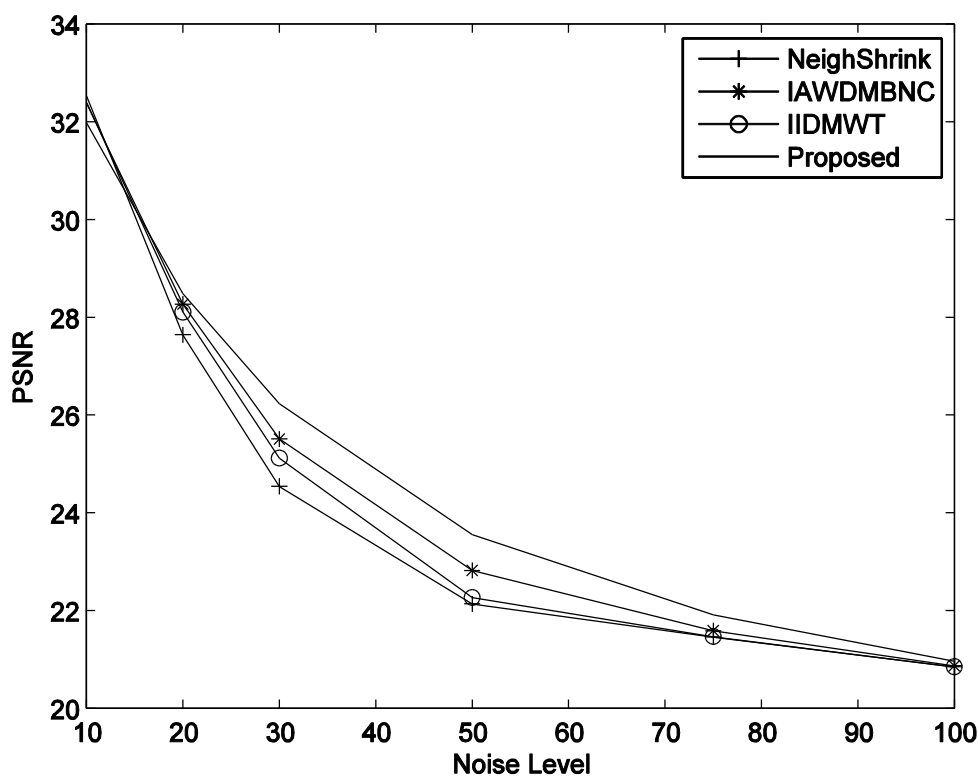


Fig. 3: Comparative performance of various denoising methods on Mandrill with noise level 10 (a) Noisy image with noise level 10; Denoised image using NeighShrink with window size (b) 3×3, (c) 5×5; Denoised image using IAWDMBNC with window size (d) 3×3, (e) 5×5; Denoised image using IIDMWT with window size (f) 3×3, (g) 5×5; Denoised image using Proposed method with window size (h) 3×3, (i) 5×5 for decomposition level three (3)



(a)



(b)

Fig. 4: PSNR gain vs. Noise level of the proposed, NeighShrink, IAWDMBNC, and IIDMWT methods for Barbara image with window size: (a) 3×3 and (b) 5×5 for decomposition level three (3)

4 Conclusion

We have proposed an adaptive image denoising technique that succeeds in removing the noise from an image. This method is completely a data-driven that improves the visual quality of a noisy image considerably and preserves the image details. Simulation results show that our proposed method outperforms over the NeighShrink, IAWDMBNC, and IIDMWT denoising methods.

References:

- [1] A. Graps, "An Introduction to Wavelets," IEEE Computational Science and Engineering, Vol. 2, No. 2, 1995.
- [2] T. Edwards, "Discrete Wavelet Transforms: Theory and Implementation," Discrete Wavelet Transforms, Stanford University, 1992.
- [3] D. L. Donoho and I. M. Johnstone, "Ideal spatial adaptation via wavelet shrinkage," Biometrika, Vol. 81, No. 3, 1994, pp. 425- 455.
- [4] D. L. Donoho, "De-Noising by Soft Thresholding," IEEE Transaction Information Theory, Vol. 41, No. 3, 1995, pp. 613-627.
- [5] D. L. Donoho and I. M. Johnstone, "Adapting to Unknown Smoothness via Wavelet Shrinkage," Journal of American Statistical Association, Vol. 90, No. 432, 1995, pp. 1200-1224.
- [6] T. T. Cai and H. H. Zhou, "A Data-Driven Block Thresholding Approach To Wavelet Estimation," Annals Statistics, Vol. 37, No. 2, 2009, pp. 569-595.
- [7] G. Y. Chen and T. D. Bui., "Multiwavelets Denoising Using Neighboring Coefficients," IEEE Signal Processing Letters, Vol. 10, No. 7, 2003, pp. 211-214.
- [8] G. Y. Chen, T. D. Bui and A. Krzyzak, "Image Denoising Using Neighbouring Wavelet Coefficients," ICASSP, 2004, pp. 917-920.
- [9] J. Jiang, J. Guo, W. Fan, and Q. Chen, "An Improved Adaptive Wavelet Denoising Method Based on Neighboring Coefficients (IAWDMBNC)," World Congress on

Intelligent Control and Automation, China, 2010, pp. 2894-2898.

- [10] H. Om and M. Biswas, "An Improved Image Denoising Method based on Wavelet Thresholding (IIDMWT)," Journal of Signal and Information Processing (USA), Vol. 3, No. 1, 2012, pp.109-116.
- [11] Y. Yang and Y. Wei, "Neighboring Coefficients Preservation for Signal Denoising," Circuits, Systems, and Signal Processing, Vol. 31, No. 2, pp. 827-832, 2012.