

Image Denoising in Wireless Communication using MATLAB

Abstract

In wireless communication, images transmitted through noisy channels often get corrupted. This project focuses on denoising techniques applied to such images using MATLAB. The study simulates the effect of an Additive White Gaussian Noise (AWGN) channel on an image and applies filtering methods like Median and Wiener filtering. The performance is evaluated using PSNR and SSIM metrics.

Introduction

Wireless communication channels are prone to noise and distortion. When transmitting multimedia data such as images, preserving quality is critical. This project demonstrates how image denoising can be achieved through digital signal processing methods. The MATLAB environment is used for simulation and analysis.

Methodology

The following steps were implemented in MATLAB:

1. Input image converted to grayscale.
2. AWGN noise added to simulate wireless transmission errors.
3. Median and Wiener filters applied for denoising.
4. Performance compared using PSNR and SSIM metrics.

Results

Both Median and Wiener filters improved the image quality compared to the noisy version. The Wiener filter generally provided better PSNR and SSIM values, indicating higher structural similarity and improved image fidelity. Visual results also confirmed that noise was reduced significantly.

Conclusion

This project successfully demonstrates denoising of images transmitted through noisy wireless channels. The results show that signal processing filters like Median and Wiener filtering are effective in improving image quality. Future work may involve implementing advanced denoising methods such as wavelet transforms or deep learning-based approaches for superior performance.

References

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2. Proakis, J. G., & Salehi, M. (2008). Digital Communications. McGraw-Hill.
3. MATLAB Documentation - MathWorks (<https://www.mathworks.com/help/>)