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Patent Search

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Abstract:

The present invention provides a Selective Convolutional Network (SeConvNet) designed to effectively remove salt-and-pepper noise from digital images while preserving fine structural details. The system includes a Noise Detection Module for generating a binary noise mask, Selective Convolutional Blocks (SeConv Blocks) for adaptive processing of noisy regions, and a Reconstruction Module for generating high-fidelity images. By performing selective convolution on only noise-affected pixels, the invention minimizes over-smoothing and residual artifacts common in traditional methods. The model is trained end-to-end using a Sum of Squared Errors (SSE) loss function and evaluated through PSNR, SSIM, and MSE metrics. The invention offers a computationally efficient, real-time, and scalable denoising framework for applications in medical imaging, remote sensing, and surveillance.

[Complete Specification](#)

Description:FIELD OF THE INVENTION

[001] The present invention relates generally to the domain of digital image processing and, more particularly, to a deep learning-based noise reduction system employing convolutional neural networks. The invention is directed to an adaptive denoising framework configured to selectively differentiate between noise-affected and noise-free regions within a digital image and to restore image quality by executing selective convolutional operations. Specifically, the invention pertains to a Selective Convolutional Network (SeConvNet) capable of effectively mitigating salt-and-pepper noise in digital images while maintaining the fidelity of fine structural and textural details. The invention finds utility in a wide range of applications, including but not limited to medical imaging, satellite and remote-sensing data enhancement, and surveillance-based visual analytics where high-precision and high-fidelity image reconstruction are essential.

BACKGROUND OF THE INVENTION

[002] Digital image acquisition systems are inherently susceptible to various forms of noise contamination arising from environmental disturbances, sensor malfunctions, or transmission errors. Among such degradations, salt-and-pepper noise—characterized by random occurrences of black and white pixels—poses a particularly challenging problem as it significantly distorts image content and degrades both perceptual quality and computational interpretability. The presence of such impulse noise in medical, surveillance, or satellite imagery adversely affects the accuracy of diagnostic, analytical, and recognition tasks, necessitating the development of reliable and efficient denoising

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