Improved adaptive median filters using nearest 4-neighbors for restoration of images corrupted with fixed-valued impulse noise Publisher: IEEE

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Abstract:

Recently we introduced an improved nearest neighborhood-based restoration (NNR) technique which when integrated in the second stage of the Adaptive Median Filter improved its performance in removing fixed valued impulse noise by giving an average increase of 7% in Peak Signal to Noise Ratio (PSNR) and 21% decrease in Mean Absolute Error (MAE). In our successive paper, we proposed a new adaptive center weighted median filter (NN-ACWM) that combined the adaptive median filtering technique with center weighted median for impulse detection and used the improved NNR technique for restoration. In this paper, we have integrated our improved nearest neighborhood-based restoration technique in the second stage of the Adaptive Center Weighted Median Filter (CW-ACWM) and have shown that this integration improves its performance in noise suppression by giving an average increase of 3% in PSNR and 13% decrease in MAE. We have also analyzed and compared the performance of the improved adaptive median filter (NN-AMF), NN-ACWM and the improved adaptive center weighted median filter (NN-CW-ACWM) in terms of PSNR, MAE and Mean Structural Similarity (MSSIM) index measures. The PSNR and MAE measures show that NN-ACWM performs better than NN-AMF and NN-CW-ACWM for noise densities <; 50 whereas NN-AMF performs better for noise densities > 50. The PSNR measures also show that NN-ACWM and NN-AMF outperforms several existing high density impulse noise removal algorithms including the Progressive Switching Median Filter, Decision Based Algorithm and Modified Decision Based Unsymmetric Trimmed Median Filter in removing fixed-valued impulse noise.

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