Novel Fuzzy Technique for Denoising Mammogram Images Damaged By Low and High Impulse Noise Density.

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Abstract

Abstract A Fuzzy logic based mean filter (FLBMF) is presented for impulse noise reduction of mammogram images degraded with additive impulse noise. FLBMF removes both low and high density impulsive noise from mammogram images. FLBMF performs this in three major phases. In phase one, the detection of noisy pixels is performed and determined. In phase two, an adaptive threshold is determined by examining the neighboring pixels. In phase three, fuzzy membership functions and fuzzy rules are used to decide whether the current pixel is noise-free, or the noise pixel is in a smooth or detailed region. All these phases are based on fuzzy rules making use of membership functions. FLBMF can be applied iteratively to effectively reduce impulsive noise. In particular, the membership function's shape is adapted according to the remaining noise level after each iteration, making use of the distribution of the homogeneity in the image. In this approach, the mammogram images are selected from mini-MIAS database and renamed as MammoB1, MammoB2, MammoB3 and MammoB4, are then deformed by varying intensities of impulse noise. The performance evaluation of various filters including FLBMF tested at low, medium and high noise densities on different standard grey scale mammogram images is then carried out. Mathematical performance parameters including Mean Square Error (MSE), Peak-signal-to-noise-ratio (PSNR), and Structural Similarity Index Measure (SSIM) are finally applied to measure the accuracy and performance of this approach. The image modalities implementation and analysis of our approach is carried out in MATLAB functions. Keywords: Impulsive Noise; FLBMF, Fuzzy membership function, Fuzzy rules, Edge preserving filtering, Fuzzy image filtering, Noise reduction

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